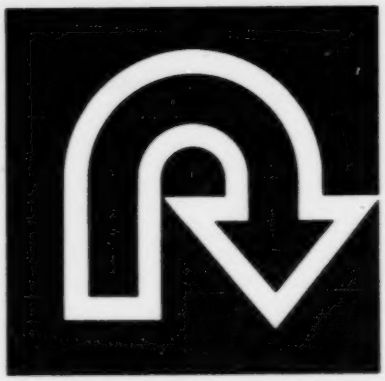
AN ANNOTATED BIBLIOGRAPHY OF DOCUMENTATION RELEVANT TO ACID PRECIPITATION IN ATLANTIC CANADA



ACID RAIN

PLUIES ACIDES

Atmospheric Environment Service
Environment Canada

March 1986

Canada

AN ANNOTATED BIBLIOGRAPHY OF DOCUMENTATION RELEVANT TO ACID PRECIPITATION IN ATLANTIC CANADA

Prepared by:
OCEANROUTES CANADA INC.

For:
ENVIRONMENT CANADA
ATLANTIC REGION

Compiled by: B.L. Taylor
Atmospheric Environment Service
1496 Bedford Highway
Bedford, N.S. B4A 1E5

March 1986

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INTRODUCTION

This bibliography attempts to list all the published and unpublished reports and papers produced by researchers investigating the various aspects of 'acid rain' in the Atlantic Provinces. The LRTAP (long range transport of airborne pollutants) phenomenon, which produces acid rain, is of particular concern to the Atlantic Provinces due to their location downwind of the major North American pollution sources and their sensitive geology and ecology.

The reports listed in the bibliography are categorized into five research areas: **Aquatic, Atmospheric, Controls, Health,** and **Terrestrial.** These sections are preceded by a **General** section for reports that cover more than one area of LRTAP research. Within each section, the reports are listed in alphabetical order by author. A short abstract is included with each report. At the end of the bibliography, all the reports are listed, without abstracts, in alphabetical order by author.

The idea for this bibliography originated with a group of Environment Canada researchers from the Atlantic Region, headed by Tom Clair (Inland Waters Directorate, Moncton, N.B.) and was produced by Susan Lally of Oceanroutes Canada, Bedford, N.S. The project was co-ordinated by Billie Taylor of the Atmospheric Environment Service, Bedford, N.S., with administrative support and funding arranged by Roger Beardmore of the Regional Director General's office of Environment Canada, Atlantic Region, Dartmouth, N.S. and by Evelyn Wilson of the Atmospheric Environment Service, Toronto, Ontario. Members of the Atlantic Region LRTAP Monitoring and Effects Working Group contributed their reports and abstracts.

As work continues to be carried out in the LRTAP field, and as additional reports on past research come to light, updates will be required to this bibliography. To facilitate updating, researchers are requested to send one copy and a short abstract for any reports, technical papers, theses, workshop proceedings, working papers, and other LRTAP documents pertaining to the Atlantic Region, whether published or unpublished, to the project co-ordinator: Ms. Billie Taylor, Atmospheric Environment Service, 1496 Bedford Highway, Bedford, N.S., B4A 1E5.

Copies of all publications will be retained in a special LRTAP reference collection in the Environment Canada Library, 45 Alderney Drive, Dartmouth, N.S. B2Y 2N6. Copies of those entries in the bibliography that are marked with an asterisk (*) have not been received by the co-ordinator and are not presently included in the collection. They should also be sent to her at the Bedford address above.

In addition, most of the documents pertaining to research activities carried out in Kejimkujik National Park, Nova Scotia, are retained in three libraries: the library at Kejimkujik National Park; the Atlantic Region Parks Canada library in Halifax, N.S.; and the Parks Canada Headquarters library in Ottawa.

B.L. Taylor
Atmospheric Environment Service
Bedford, N.S.
March 19, 1986

GENERAL

Atmospheric Environment Service, 1979. **Proceedings of a Workshop on Long Range Transport of Air Pollution and Its Impacts on the Atlantic Region.** Atmospheric Environment Service, Bedford, N.S.

Abstract: A workshop was held on October 17 and 18, 1979, with the twin objectives of disseminating knowledge and understanding of the LRTAP problem and assisting research scientists and managers to identify those aspects of the problem of particular significance to the Atlantic provinces.

Papers presented:

Elder, F.C. **Overview of LRTAP Aquatic Effects Program.** Pp. 67-80.

Gorham, E. **Long Range Transport of Air Pollution: A United States Perspective on Acid Rain as an Ecological Problem.** Pp. 5-18.

Jones, E.P. **An Overview of Long Range Transport of Air Pollutants.** Pp. 57-61.

Peterson, R.H. **LRTAP: Effects on Fishes.** Pp. 83-85.

Rennie, P.J. **Long Range Pollution and Acid Rain: Factors in the Terrestrial Environment.** Pp. 35-44.

Shaw, R.W. **Atmospheric Transport and Deposition of Pollutants in the Atlantic Provinces.** Pp. 19-25.

Shaw, R.W. **Monitoring and Modelling of the Long Range Atmospheric Transport and Deposition of Pollution: An Overview with Respect to the Atlantic Region.** Pp. 94-103.

Sidhu, S.S. **LRTAP: Susceptibility of Terrestrial Systems in the Atlantic Provinces.** Pp. 47-52.

Underwood, J.K. **pH of Precipitation and Annual Deposition of Excess Sulfate, Acidity, and Nitrate on Nova Scotia.** Pp. 25-34.

Uthe, J.F. and H.C. Freeman. **Polychlorinated Biphenyl, Levels and Biological Effects in Cod (*Gadus morhua*).** Pp. 62-63.

Watt, W.D. **The Impact of Local Industrial Emissions on the Acidity of Lakes in the Halifax Area.** Pp. 86-90.

Whelpdale, D.M. **An Overview of LRTAP: Emissions, Transport, Transformation and Deposition.** Pp. 3-4.

Atmospheric Environment Service, 1982. **Proceedings of the Long Range Transport of Airborne Pollutants Atlantic Region Workshop.** Atmospheric Environment Service, Bedford, N.S.
Abstract: A workshop was held on November 16, 1982, to review and discuss the national and regional LRTAP programs.

Atmospheric Environment Service, 1983. **The Federal Calibrated Watershed Program: A Critical Assessment.** Report from Workshop in Bedford, N.S., Nov. 17-18, 1982.
Abstract: The four watershed programs sponsored by the federal government constitute one of the key components of the overall federal program to assess the consequences of environmental acidification. The Kejimkujik watershed in Nova Scotia is one of the federal watersheds whose program was reviewed and evaluated at the meeting in November 1982.

Department of Fisheries and Environment, 1977. **Long Range Transport of Atmospheric Pollution - An Atlantic Perspective.** Prepared by the Technical Committee on Long Range Transport of Atmospheric Pollution, Atlantic Regional Board, Department of Fisheries and Environment.
Abstract: As a contribution to the national Long Range Transport of Atmospheric Pollution (LRTAP) program, the Atlantic Regional Board of the Department of Fisheries and Environment established a Technical Committee charged with the task of collating and analysing all existing data and research relevant to the LRTAP problem in the Atlantic provinces, making recommendations to the Board on further initiatives in this subject area and, in general, providing support to the national program. This paper is a preliminary report which documents the results of the Technical Committee's work to date on the first two of the tasks noted above.

Department of Fisheries and Oceans, No date. **Acid Rain - A Newfoundland and Labrador Perspective.** Department of Fisheries and Oceans, Newfoundland Region, St. John's, Nfld.
Abstract: This booklet gives an overview of the acid rain problem as it relates to Newfoundland and Labrador.

Environment Canada, 1981. **Acid Rain.** Ottawa, Ont.
Abstract: A brief overview of the acid rain issue is presented as a public information brochure. The publication was produced by Environment Canada in cooperation with the provincial governments of the four Atlantic provinces.

Environmental Conservation Service, 1985. **Long Range Transportation of Airborne Pollutants: Bibliography 1980-1984, Environmental Conservation Service.** Environment Canada, Ottawa. LRTAP No. 1.

Abstract: This bibliography includes published and unpublished reports, technical papers, workshop proceedings, working papers, and other LRTAP publications from the three ECS directorates: Canadian Wildlife Service, Inland Waters Directorate, and Lands Directorate.

Fairchild, F.P., J. Bridge, C. Fausold, W.C. Ayer and L. Lapointe, 1982. **Acid Precipitation and the Long Range Transport of Air Pollutants in Eastern Canada and New England.** A report prepared for the New England Governors and Eastern Canadian Premiers.

Abstract: The report summarizes the available information on LRTAP and acid deposition in New England and Eastern Canada, attempts to identify and clarify areas of controversy, known data on effects and the economic consequences of damages and controls.

Freedman, B. and J.G. Ogden, III, 1981. **Sources and Consequences of Acid Rain in Nova Scotia.** Prepared for The Nova Scotia Resources Council with the assistance of The Nova Scotia Environmental Control Council.

Abstract: The sources and effects of acidic precipitation on various components of the environment are discussed and remedial measures for Nova Scotia are recommended.

Kerekes, J. (ed.), 1982. **Workshop Proceedings, Kejimkujik Calibrated Catchments Program on the Aquatic and Terrestrial Effects of the Long-Range Transport of Air Pollutants, November 18, 1981.** Atlantic Region LRTAP Monitoring and Effects Working Group.

Abstract: The Proceedings provide an overview of the work being done in the Kejimkujik Catchments of Nova Scotia.

Papers presented:

Ambler, D.C. and R.A. Pol. **Surface water data: collection and interpretation.** Pp. 15-16.

Beauchamp, S.T. and J. Kerekes. **Planktonic primary production in three lakes.** Pp. 47-49.

Blouin, A.C. and P. Lane. **Zooplankton studies.** Pp. 55-56.

Brun, G.L. **Trace organic contaminants in precipitation at Kejimkujik National Park.** Pp. 13-14.

Clair, T.A. **Chironomidae populations in the Kejimkujik calibrated basins.** P. 41.

Clair, T.A. and G.A. Nielsen. **Daily sampling of the Mersey River.** P. 25.

Delorme, L.D., S.R. Esterby and H. Duthie. **Prehistoric trends in pH for Kejimkujik Lake, Nova Scotia.** Pp. 39-40.

Gates, A.D. **A note on the precipitation climate of Kejimkujik National Park.** Pp. 3-7.

Gibb, J.E. **Groundwater characterization study, Beaverskin Lake watershed, Kejimkujik.** P. 17.

Howell, G. and J. Kerekes. **Status of Kejimkujik lakes as of July, 1980.** Pp. 27-29.

Kerekes, J. **Fish distribution in Kejimkujik National Park.** Pp. 57-61.

Kerekes, J. **Inputs-outputs of major ions in the Kejimkujik watersheds (June 1978 - May 1981).** Pp. 31-37.

Oliver, B.G. **The organic contribution to the acidity of natural waters, and the acid neutralization capacity of sediments.** Pp. 23-24.

Percy, K.E. **Baseline characterization of the vegetation and soils in Beaverskin and Pebbleloggitch catchments and preliminary results of the precipitation chemistry study.** Pp. 19-20.

Peterson, R.H. **Age-size structure of fish sampled from lakes in the calibrated watershed.** Pp. 63-64.

Pollock, T.L. **Analytical aspects (water, sulphate).** Pp. 21-22.

Rao, S.S. **Microbiological studies of the Kejimkujik watershed.** Pp. 43-45.

Stewart, C.C. and B. Freedman. **Macrophyte communities in three lakes in Kejimkujik National Park.** Pp. 51-53.

Wiebe, H.A., K.G. Anlauf, P. Fellin, L.A. Barrie and K.J. Puckett. **Atmospheric field measurement program at Kejimkujik National Park.** Pp. 9-11.

Kerekes, J. (ed.), 1983. **Workshop Proceedings, Kejimkujik Calibrated Catchments Program on the Aquatic and Terrestrial Effects of the Long-Range Transport of Air Pollutants.** Atlantic Region LRTAP Monitoring and Effects Working Group. April 26, 1983.

Abstract: The Proceedings provide an overview of the work being done in the Kejimkujik Catchments of Nova Scotia.

Papers presented:

Ambler, D.C. **Surface Water Hydrology.** Pp. 15-23.
Beauchamp, S. and J. Kerekes. **Annual changes in planktonic primary production in three lakes.** P. 59.
Blouin, A., P.A. Lane and T. Collins. **Quantitative analysis of lake communities and enclosure experiments in Kejimkujik National Park.** Pp. 63-66.
Clair, T. **Major ion dynamics of an acid stressed river in Nova Scotia.** P. 47.
Dale, J. and B. Freedman. **Effects of acidity on Nova Scotia amphibians.** P. 71.
Garside, E.T. and P.G. Daye. **Structural alterations and reproductive status of white perch from acid-stressed lakes.** P. 73.
Howell, G. and J. Kerekes. **Relationships between water color and sulphate measurements.** Pp. 29-34.
Jacques, Whitford and Associates Ltd. **Groundwater characterization, Beaverskin Lake.** P. 25.
Kerekes, J. **Ion balances with the methylthymol blue and ion chromatography sulphate determinations.** Pp. 41-46.
Kerekes, J. **Seasonal and annual changes in major ions in selected tributaries of the three catchments.** Pp. 49-53.
Kerekes, J. and G. Howell. **Ionic export from the watersheds.** Pp. 55-58.
Lane, P.A., A. Blouin and T. Collins. **Qualitative analysis of lake foodwebs in Kejimkujik National Park.** Pp. 67-69.
Percy, K. **Precipitation Chemistry in Beaverskin Catchment, Kejimkujik National Park, 1980-82.** Pp. 7-13.
Pollock, T.L. and V.A. Komadina. **Determination of sulphate in Atlantic Canada surface waters.** P. 27.
Stewart, C. and B. Freedman. **Major macrophyte communities and limiting factors for three lakes in Kejimkujik National Park.** Pp. 61-62.
Taylor, B.L. **Large acidic deposition episodes at Kejimkujik.** P. 5.
Underwood, J.K., R.F. McCurdy and D. Borgal. **Effects of color interference on ion balances in Atlantic Canada lake waters using methylthymol blue sulphate results: Some preliminary observations.** Pp. 35-39.
Whelpdale, D.M. **Status of AES Studies at Kejimkujik.** Pp. 3-4.

Kerekes, J. and J. Dale, 1985. **Bibliography, Kejimkujik Calibrated Catchments Program (Nova Scotia) on The Aquatic and Terrestrial Effects of the Long-Range Transport of Air Pollutants.** Environment Canada, Canadian Wildlife Service, c/o Biology Department, Dalhousie University, Halifax, N.S.

Abstract: This bibliography lists reports and publications dealing with the effects of the long range transport of air pollutants on the Kejimkujik, N.S. calibrated catchments.

Martin, H.C., 1979. **The Long-Range Transport of Air Pollutants: A Threat to the Watersheds of Eastern Canada.** Atmospheric Environment Service, Downsview, Ont. Presented at the Canadian Water Resources Association 32nd Annual Conference.

Abstract: A general description of LRTAP and its relationship to the quality of freshwater systems is given, as well as detailed characteristics of the LRTAP problem in North America and a discussion of the federal LRTAP program.

Nova Scotia Environment, 1981. **Nova Scotia Department of the Environment Submission to the Sub-Committee on Acid Rain of the Standing Committee on Fisheries and Forestry.** N.S. Dept. of Environment, Halifax, N.S.

Abstract: This submission consists of an overview of the current information available on acidic precipitation in Nova Scotia; the contribution of international, national and provincial sources to acid deposition in Nova Scotia; and, the contribution of Nova Scotia's activities to acid deposition in other jurisdictions. It is estimated that 52,000 tonnes of non-marine sulphur are deposited in Nova Scotia annually. Of this, 10,600 tonnes (20%) originate from within the province. The effects of acidification on lakes, terrestrial environments, human health, and buildings are reviewed.

Shaw, R.W., 1977. **Long Range Transport of Air Pollution: Atlantic Region.** Environmental Protection Service, Halifax, N.S. Report to the Halifax Centre of the Canadian Meteorological and Oceanographic Society.

Abstract: Evidence for the long range transport of air pollution in Europe and in the Atlantic Region is presented and the effects on aquatic and terrestrial ecosystems are discussed.

Shaw, R.W., 1982. **Knowns and Unknowns about Acid Precipitation in Atlantic Canada.** Northeast Environmental Science, 1 (3 & 4): 220-233.

Abstract: Atlantic Canada, an area sensitive to acid precipitation which is located downwind of major source areas in eastern and central North America, affords one ample opportunity to study both the effects and origins of acid precipitation. This paper examines the strength of each link in the chain of events from emission to ecological effects.

Shaw, R.W. (ed.), 1983. **Report of the Fall 1983 Workshop of the Atlantic Region LRTAP Monitoring and Effects Working Group.** Environment Canada, Dartmouth, N.S.

Abstract: A workshop was held on November 1 and 2, 1983, to give the participants an opportunity to review their past year's LRTAP work and to address regional issues.

Spavold, A.J., 1979. **Long Range Transport of Atmospheric Pollutants in the Atlantic Provinces: Recommendations for a Provincial Program.** Environmental Services Branch, Environment New Brunswick, Fredericton, N.B. Tech. Rep. No. T-7901.

Abstract: Issues pertaining to LRTAP in the Atlantic Provinces, including research activities, are summarized and recommendations for a provincial monitoring program are put forward.

Taylor, B.L. (ed.), 1984. **Report of the Fall 1984 Workshop of the Atlantic Region LRTAP Monitoring and Effects Working Group.** Atmospheric Environment Service, Bedford, N.S.

Abstract: A workshop was held on November 15, 1984, to give the participants an opportunity to review the past year's LRTAP work and to receive guidance on future directions for regional research.

Papers presented:

Clair, T.A. **Kejimkujik Basin Studies.** Pp. 86-98.
Elder, F.C. **Review of the National Aquatic Effects Program.** Pp. 28-41.
Kerekes, J.J. **Review of the Regional Aquatic Program.** Pp. 83-85.
Knight, J.F.L. **Saint John Sulphur Deposition Study.** Pp. 66-69.
Kozak, J.H. **Update on Control Strategies.** Pp. 99-110.
Mahendrappa, M.K. **Review of the Regional Terrestrial Program.** Pp. 70-82.
Meranger, J.C. **Health Effects Studies.** Pp. 42-54.

Rennie, P. **Review of the National Terrestrial Program.** Pp. 21-27.

Shaw, R.W. **Status of the Federal LRTAP Technical Program.** Pp. 4-15.

Taylor, B.L. **Review of the Regional Atmospheric Program.** Pp. 56-65.

Whelpdale, D.M. **Review of the National Atmospheric Program.** Pp. 16-20.

Taylor, B.L. (ed.), 1985. **Report of the Fall 1985 Workshop of the Atlantic Region LRTAP Monitoring and Effects Working Group.** Atmospheric Environment Service, Bedford, N.S.

Abstract: A workshop was held on December 2, 1985, to give the participants an opportunity to review the past year's LRTAP work.

Papers presented:

Bourbonniere, R.A. **Naturally-Occurring Organic Acids in Nova Scotia Waters.** Pp. 36-39.

Clair, T.A. **Snow and Water Chemistry at Kejimkujik National Park in 1984-85.** P. 35.

Cox, R.M. ***In Vitro* and *In Vivo* Effects of Acidity and Trace Elements on Pollen Function.** Pp. 78-89.

Elder, F.C. **Overview of LRTAP Aquatic Effects Program.** Pp. 105-112.

Gibb, J.E. **Acid Drainage from Exposed Mineralized Slate in Nova Scotia.** Pp. 63-64.

Hirvonen, H.E. **LRTAP Initiatives of the Office of the Regional Director General.** Pp. 100-101.

Howell, G. **Water Quality Branch LRTAP Monitoring.** Pp. 33-34.

Kerekes, J.J. **Report on the Kejimkujik Basin Study.** Pp. 28-32.

Knight, J.F.L. **Saint John Sulphur Deposition Study Update.** Pp. 19-27.

Kozak, J.H. **Federal/Provincial SO_2 Reduction Agreements in the Atlantic Provinces.** Pp. 95-98.

Mahendrappa, M.K. **Terrestrial Effects Studies at CFS-Maritimes.** Pp. 65-77.

Martin, H.C. **National Scientific Program.** Pp. 102-104.

Peterson, R.H. and S. Ray. **Polluted Burdens in Lake Fishes from Various Parts of New Brunswick and Nova Scotia.** Pp. 40-41.

Scruton, D.A. **Overview of Fisheries and Oceans LRTAP Activities in Newfoundland 1980-85, with an Outlook to Future Research and Monitoring.** Pp. 42-62.

Spavold Tims, A.J. **Effects of LRTAP on Sugar Maples and Potatoes in New Brunswick.** Pp. 90-94.

Taylor, B.L. **An Annotated Bibliography of Documentation Relevant to Acid Precipitation in Atlantic Canada.** P. 99.

Taylor, B.L. **Evaluation of the Precipitation Chemistry Networks in the Atlantic Region and Proposal to Standardize Procedures.** Pp. 1-18.

Underwood, J.K., 1981. **Acidic Precipitation in Nova Scotia.** Nova Scotia Department of the Environment, Halifax, N.S.

Abstract: This report examines the concerns about acid precipitation in the Province of Nova Scotia. It reviews deposition, emission sources and presents the first diatom evidence of acidification in the province. Results of programs of liming lakes and rivers are discussed.

AQUATIC

Ambler, D.C., 1983. **Surface Water Hydrology - Kejimkujik Calibrated Catchment Program on the Aquatic and Terrestrial Effects of the Long-Range Transport of Air Pollutants.** Rep. IWD-AR-WRB-83-43. Inland Waters Directorate, Environment Canada, Dartmouth, N.S.

Abstract: An understanding of the physical processes of the surface water component in the hydrologic cycle supports the ability to both understand and forecast the movement of atmospheric pollutants once they have entered the surface water phase. The study area is within the Mersey River watershed in West Central Nova Scotia. This report interprets the surface water data collected and calculates a water balance and a monthly flow estimate.

Andrews, D., 1980. **Benthic phosphorous release and primary production in three lakes in Kejimkujik National Park.** Ms. Report. Canadian Wildlife Service, Halifax, N.S.

Abstract: The effects on phosphorus movement and storage in sediments of increases in lake acidity caused by atmospheric pollutants are largely unknown. In this study, phosphorus release rates and interstitial profiles were obtained in three lakes in Kejimkujik National Park, N.S. Benthic primary production was also estimated from incubations of sediment cores.

Barringer Magenta Ltd., 1981. **Report on analysis of water, sediment, tissues and vegetation samples (Data report, Kejimkujik Lakes).** Rep. No. CW-81-1/80-1045-G-190 to Canadian Wildlife Service. *

Abstract: Concentrations of 21 trace metals are given from Beaverskin, Pebbleloggitch and Kejimkujik Lakes in Kejimkujik National Park for the following lake and biota compartments: water (17); sediment (16); fish (94, three species); benthic invertebrates (8); plankton (15) and macrophytes (46, three species). Numbers in brackets indicate the number of samples.

Beauchamp, S.T., 1980. **Preliminary characterization of aquatic macrophyte distribution and biomass in Beaverskin and Pebbleloggitch Lakes, Kejimkujik National Park, Nova Scotia.** Ms. Report. Canadian Wildlife Service, Halifax, N.S.

Abstract: Studies were initiated in 1978 to obtain baseline data on limnological aspects of two small headwater lakes in Kejimkujik National Park in order to assess the impact of high acid loading. This report is a summary of early efforts to obtain information on aquatic macrophyte species.

Beauchamp, S.T., 1983. **Planktonic Primary Production in Three Acid-Stressed Lakes in Nova Scotia.** M.Sc. Thesis, Dalhousie University, Halifax, N.S. *

Abstract: This study has two main concerns dealing with planktonic primary production in three acidic lakes in central Nova Scotia. The primary objective was to measure daily and seasonal trends in primary production and productivity and arrive at an estimate of annual planktonic primary production. A secondary objective was to analyse for underlying relationships between physical, chemical and biological properties of each lake and primary production. The study was carried out through two water years (May 1979 - April 1981).

Beauchamp, S.T., R. Tordon and J.J. Kerekes, 1984. **Fish Distribution in Five Acidic Tributaries to Kejimkujik Lake and Possible Adverse Effects of Acidification.** Report prepared for Parks Canada by Canadian Wildlife Service, Halifax, N.S.

Abstract: Five acidic streams in Kejimkujik National Park were briefly surveyed for fish distribution. Numbers and biomass per unit area were lowest in the four most acidic streams. There were no significant correlations between species, numbers or biomass with aluminum concentrations.

Blouin, A.C., T.M. Collins and J.J. Kerekes, 1984. **Plankton of an acid-stressed lake (Kejimkujik National Park, Nova Scotia, Canada). Part 2. Population dynamics of an enclosure experiment.** Verh. Internat. Verein. Limnol. 22: 401-405.

Abstract: Plankton community responses to additions of acid, lime and nutrients were documented, and an attempt made to explain alterations in food web interactions using a previously developed modeling technique. Species were grouped for modeling by their relationships to other species and physical-chemical variables. Some enclosure effects were noted.

Blouin, A.C., P.A. Lane, T.M. Collins and J.J. Kerekes, 1984. **Comparison of plankton-water chemistry relationships in three acid stressed lakes in Nova Scotia, Canada.** Int. Revue ges. Hydrobiol. 69: 819-841.

Abstract: A field program was conducted in 1980 and 1981 on three lakes in Kejimkujik National Park, N.S., to study plankton-water chemistry relationships in a region of potential acid precipitation stress. Among lake and between year comparisons were made.

Carter, J.C.H., W.D. Taylor, R. Chengalath and D.A. Scruton, 1986. **Limnetic zooplankton assemblages in Atlantic Canada with special reference to acidification.** Can. J. Fish. Aq. Sci. 43. (In press). *

Abstract: Crustacean and rotifer plankton assemblages of 93 lakes in Labrador, 107 in Newfoundland and 142 in New Brunswick-Nova Scotia were investigated for evidence of correlations with lake morphometric, chemical or biological factors. Only one species in Labrador and Newfoundland was significantly correlated to a derived factor related to lake water buffering capacity. However, New Brunswick-Nova Scotia lakes differing in their buffering capacity were distinct in zooplankton composition.

Chengalath, R., W.J. Bruce and D.A. Scruton, 1984. **Rotifer and crustacean plankton communities of lakes in insular Newfoundland.** Verh. Internat. Verein. Limnol. 22: 419-430.

Abstract: Zooplankton collections from 109 lakes in insular Newfoundland are examined to characterize the zooplankton fauna of the region. Study lakes are described in relation to key chemical and morphological parameters.

Clair, T.A., 1985. **Chemical and Physical Characteristics of Snow in the Kejimkujik National Park Area in 1983-84.** Int. Rep. No. IWD-AR-WQB-85-86. Inland Waters Directorate, Environment Canada, Moncton, N.B.

Abstract: Snow chemistry and water content in Kejimkujik National Park were analyzed at two sites separated by 15 km. The study showed significant meso-scale variations in water and chemical content of snow. During the season, there were rapid changes in snow depth and water content at each site.

Clair, T.A., 1986. **Chemical and Physical Characteristics of Snow in the Kejimkujik National Park Area (II) Winter 1984-85.** Tech. Rep. IWD-AR-WQB-86-95. Inland Waters Directorate, Environment Canada, Moncton, N.B. *

Abstract: Snow samples were collected weekly from January 10 to March 10, 1985, along each of two 150-m long transects in the Mersey River basin in southwest Nova Scotia. The data show that nitric acid is more important than sulfuric in the snow pack at both sites.

Clair, T.A., D.R. Engstrom and W. Whitman, 1982. **Data Report: Water Quality of Surface Waters of Newfoundland and Labrador.** Water Quality Branch, Moncton, N.B. *

Abstract: This report presents all data collected by the Water Quality Branch, the University of Minnesota and the Canadian Wildlife Service surveys in Newfoundland and Labrador from 1979 to 1981.

Clair, T.A. and V. Komadina, 1984. **Aluminum speciation in waters of Nova Scotia and their impact on Water Quality Branch analytical and field methods.** Tech. Rep. IWD-AR-WQB-84-69, Inland Waters Directorate, Moncton, N.B.

Abstract: This study was designed to assess the use of a speciation method, the Chelex-100 method, under field conditions, to measure the labile Al levels in representative waters of Nova Scotia and to make recommendations on future directions in speciation work in the region.

Clair, T.A. and P.H. Whitfield, 1983. **Trends in pH, calcium and sulfate of rivers in Atlantic Canada.** Limnol. Oceanogr. 28: 160-165.

Abstract: Acid precipitation is affecting the chemistry of rivers in Atlantic Canada. Long term records for pH, calcium, and sulfate from 11 rivers were fitted using time series models. Decreases in pH over time were found, but the results for calcium and sulfate were not consistent with the predicted model. The conceptual models used to understand the effects of acid precipitation on water chemistry did not adequately explain the observed changes.

Clair, T.A., J.P. Witteman and S.H. Whitlow, 1982. **Acid precipitation sensitivity of Canada's Atlantic Provinces.** Tech. Bull. 124, Inland Waters Directorate, Moncton, N.B.

Abstract: Average pH and acid sensitivity contours were estimated from water quality data collected at over 110 sites in the Atlantic Provinces. Results indicate very high sensitivity to acid precipitation in southwest Nova Scotia, parts of Cape Breton, and most of Newfoundland and Labrador. Surface water pH results show that acid sensitive areas in Nova Scotia and Newfoundland have generally low pH levels, whereas those in Labrador retain high levels.

Clifford, P.J., 1984. **Effects of Acidification and Eutrophication on Benthic Invertebrates in Three Nova Scotia Lakes.** H. B.Sc. Thesis, Dalhousie University, Halifax, N.S. *

Abstract: Benthic macroinvertebrate populations of three acidic lakes in Nova Scotia were sampled from May to August, 1983. Acidity appeared to regulate the community composition of the benthos.

Collins, T.M. and P.A. Lane, 1984. **Plankton of an acid-stressed lake (Kejimkujik National Park, Nova Scotia, Canada). Part 1. Design and water chemistry results of an enclosure experiment.** Verh. Internat. Verein. Limnol. 22: 395-400.

Abstract: The responses of acid-stressed Beaverskin Lake to acid, lime and nutrient loadings were studied using a multiple enclosure system, to elucidate causal pathways at the food web level. Similar nutrient trends observed in the controls and limed and acidified enclosures are best explained by the phosphorous-limiting nature of the system. Some type of auxiliary buffering acting at low pH could have resulted from either a physical or biological enclosure effect.

Cowell, D.W., A.E. Lucas, H. Hirvonen, G. Gilbert, G.M. Wickware and C.D.A. Rubec, 1983. The potential of soils and bedrock to reduce the acidity of incoming acid deposition for eastern Canada, Appendix I (Figure 3.9) and Section 3.5 Aquatic ecosystems sensitive to acid deposition pp. 3.30-3.46; Section 4.5 Sensitivity assessment (Terrestrial Impacts) pp. 4.64-4.82. IN: **USA-Canada Memorandum of Intent on Transboundary Air Pollution.** Final Report Phase III, Impact Assessment Working Group I, MOI Secretariat, Environment Canada, Burlington, Ont.

Abstract: The topics discussed in Section 3.5 include the watershed sensitivity of eastern North America to acidic deposition, aquatic-terrestrial relationships, and geochemical changes in soils due to acidic precipitation. Terrestrial sensitivity mapping and interpretations for eastern North America are presented in Section 4.5.

Dale, J.M., 1984. **Effects of Acidity and Associated Water Chemistry Variables on the Occurrence and Reproduction of Nova Scotia Amphibians.** M.Sc. Thesis, Dalhousie University, Halifax, N.S. *

Abstract: 159 field sites in south and central Nova Scotia were surveyed for amphibians. Water samples were also analyzed. There is considerable variation in acid tolerance among species.

Dale, J.M. and B. Freedman, 1983. **Effects of Acidity on Nova Scotia Amphibians. First Annual Report.** Prepared for the Canadian Wildlife Service, Halifax, N.S.

Abstract: The most susceptible stages of many amphibian life histories coincide with the most acidic breeding site conditions. The study indicates that the critical pH threshold is about 4.0 and that relatively few field sites had pH's that were sufficiently low to impair the reproduction of amphibians.

Dale, J.M., B. Freedman and J. Kerekes, 1985. **Acidity and associated water chemistry of amphibian habitats in Nova Scotia.** Can. J. Zool. 63: 97-105.

Abstract: Over 150 sites were surveyed for the presence of 11 species at various life stages, and the sites' water chemistries analyzed.

Dale, J.M., B. Freedman and J. Kerekes, 1986. **Experimental studies of the effects of acidity and associated water chemistry on amphibians.** Proceedings Nova Scotia Institute of Science. (In press). *

Abstract: Laboratory bioassays revealed that pH 4.0 to 5.0 was the critical range within which developing amphibian embryos suffered reduced hatching success, and below which hatching did not occur. Differences in acid tolerance among species were also revealed.

Daye, P.G. and B.D. Glebe, 1984. **Fertilization Success and Sperm Motility of Atlantic Salmon (*Salmo salar* L.) in Acidified Water.** Aquaculture, 43: 307-312.

Abstract: Tests showed no effect on fertilization success at pH 5.0 or above, but no fertilization at all below pH 4.0. Recruitment of young salmon is reduced below pH 5.0, and populations probably do not exist below pH 4.5.

Delorme, L.D., S.R. Esterby and H. Duthie, 1984. **Prehistoric pH trends in Kejimkujik Lake, Nova Scotia.** Int. Revue ges. Hydrobiol. 69 (1): 41-55.
Abstract: This study examined the past history of Kejimkujik Lake as recorded by fossil diatoms from a sediment core to determine why the current pH is so low. The overriding effect on the lake appears to have been the presence of organic soils and bogs.

Drysdale, C.D., 1980. **The Brook Trout (*Salvelinus fontinalis*) and Low Environmental pH; A Literature Review and Discussion.** Parks Canada, Kejimkujik National Park. Presented at the 1981 Acid Rain Workshop.
Abstract: This report reviews published research on the impact of low environmental pH as it pertains to the life history and population dynamics of the brook trout. Discussion of the observed effects of various pH levels on nesting behavior; fecundity; egg, fry, fingerling and adult survival and physiology is presented.

Duthie, H.C., 1981. **Evidence of pH changes in Kejimkujik and Beaverskin Lakes, Nova Scotia from sediment core diatom analysis.** Final Report. University of Waterloo, Waterloo, Ont. *
Abstract: This report is the basis for the paper by Delorme, Esterby and Duthie (1984).

Elder, F.C., 1984. **Summary of Workshop on Acidification of Organic Waters, Halifax, N.S., Nov. 1983.** Report to the Federal/Provincial Research and Monitoring Coordinating Committee. National Water Research Institute, Burlington, Ont.
Abstract: The Workshop was called to allow the exchange of information on the issue of acidification of organic waters.

Farmer, G.J., T.R. Goff, D. Ashfield and H.S. Samant, 1981. **Some effects of the acidification of Atlantic salmon rivers in Nova Scotia.** IN: Acid Rain and the Atlantic Salmon, Proceedings of a Conference held Nov. 1980. International Atlantic Salmon Foundation Special Publication 10.
Abstract: The probable cause of mortality of Atlantic salmon parr reared at the Mersey Hatchery, N.S., was the increase in acidity during the spring. Treatment of the hatchery water with calcium carbonate enhanced parr survival.

Freedman, B., C. Stewart and U. Prager, 1985. **Patterns of water chemistry of four drainage basins in central Nova Scotia.** Tech. Rep. IWD-AR-WQB-85-93. Inland Waters Directorate, Environment Canada, Moncton, N.B.

Abstract: The report describes changes and variable inter-relationships of waters draining four of the Kejimkujik basins which contain organic acids in various amounts, but receive the same acid deposition levels. The data presented are still in a raw form, and are being further interpreted.

Hawkins, G.R. and A.J. Spavold Tims, 1984. **The Sensitivity of New Brunswick Ecosystems to Acidification.** Tech. Rep. No. T-8401. Environment New Brunswick, Fredericton, N.B.

Abstract: A large portion of New Brunswick's land mass was found to be sensitive to acidification due to the predominant non-calcareous surficial and bedrock geology. An evaluation of Environment New Brunswick surface water chemistry data collected from 1973 to 1980 on 64 lakes and 77 rivers shows that waters in southwestern and north central New Brunswick are the most susceptible to acid rain. Based on alkalinity, 40 lakes and 34 rivers were found to be sensitive to acidification.

Hinch, P.R., J.K. Underwood and H.H. Vaughan, 1982. **Acid Rain and Lakes in Nova Scotia: Annotated Bibliography of Studies of Nova Scotia Lakes.** Draft Report. Nova Scotia Department of the Environment, Halifax, N.S.

Abstract: This bibliography includes reports containing Nova Scotia lake chemistry data covering the period 1906 to 1982 inclusive. For each report it gives information on the lakes studied, results obtained and the relevance to lake acidification.

Howell, G. and J. Kerekes, 1983. **Colour Interference of Sulphate Measurements in Kejimkujik Surface Waters.** Ms. Report. Canadian Wildlife Service, Halifax, N.S.

Abstract: The relationship between water colour and the difference between two sulphate measurement techniques was investigated. The methyl thymol blue method overestimates due to interference caused by coloured organic matter.

Kerekes, J.J., 1968. **The Chemical Composition of Lake Waters in Kejimkujik National Park, Nova Scotia.** Ms. Report. Canadian Wildlife Service, Halifax, N.S.

Abstract: The report summaries the results of water analyses completed in 1966 in Kejimkujik National Park. It was found that surface waters are very low in dissolved constituents and are all acidic (pH 5.0-6.2).

Kerekes, J.J., 1980. **Preliminary characterization of three lake basins receiving acid precipitation in Nova Scotia.** Ms. Report. Canadian Wildlife Service, Halifax, N.S.

Abstract: The physical, climatic and chemical characteristics of three lake basins in Kejimkujik National Park are described.

Kerekes, J.J., 1980. **Preliminary characterization of three lake basins sensitive to acid precipitation in Nova Scotia, Canada.** IN: D. Drablos and A. Tollan (eds.), Ecol. Impact of Acid Precip., Proc. Int. Conf., Sandefjord, Norway, March 11-14. Pp. 232-233.

Abstract: The characteristics of three sensitive lake basins in Kejimkujik National Park are described.

Kerekes, J.J., 1980. **1980 LRTAP Program Progress Report.** Canadian Wildlife Service, Halifax, N.S.

Abstract: The reports completed, scientific conclusions reached and descriptions of the projects undertaken for the 1980 Canadian Wildlife Service LRTAP Program are outlined in this document.

Kerekes, J.J., 1981. **Summary of Reports, Kejimkujik National Park Calibrated Watersheds Study. Environmental Contaminants Control Fund, 1980-81.** Canadian Wildlife Service, Halifax, N.S.

Abstract: Seven reports dealing with the collection of baseline chemical and biological data from three watersheds within Kejimkujik National Park are summarized.

Kerekes, J.J., 1982. **The sensitivity and response of surface waters to acid precipitation in the Atlantic National Parks and Labrador.** Report to Parks Canada. Canadian Wildlife Service, Halifax, N.S. *

Abstract: The sensitivity of surface waters to acidic precipitation in the Atlantic Region National Parks and Labrador is assessed based on plots on Henriksen's nomogram (Ca + Mg versus SO_4^* - pH).

Kerekes, J. (ed.), 1982. **Workshop Proceedings, Kejimkujik Calibrated Catchments Program on the Aquatic and Terrestrial Effects of the Long-Range Transport of Air Pollutants, November 18, 1981.** Atlantic Region LRTAP Monitoring and Effects Working Group.
Abstract: The Proceedings provide an overview of the work being done in the Kejimkujik Catchments of Nova Scotia. See GENERAL section for list of contents.

Kerekes, J. (ed.), 1983. **Workshop Proceedings, Kejimkujik Calibrated Catchments Program on the Aquatic and Terrestrial Effects of the Long-Range Transport of Air Pollutants.** Atlantic Region LRTAP Monitoring and Effects Working Group. April 26, 1983.
Abstract: The Proceedings provide an overview of the work being done in the Kejimkujik Catchments of Nova Scotia. See GENERAL section for list of contents.

Kerekes, J., 1984. **Canadian Wildlife Service LRTAP Investigations, Kejimkujik Calibrated Basins Study.** LRTAP III Submission for Royal Society of Canada Peer Review.
Abstract: The Kejimkujik Watershed Study and the aquatic and biological studies at Kejimkujik National Park, N.S., are described.

Kerekes, J.J., S. Beauchamp and T. Pollock, 1982. **Water Quality Data: Major ions, metals and nutrients, 1978, 1979. LRTAP Calibrated Lake Basin Studies, Kejimkujik National Park.** Data Report. Canadian Wildlife Service, Halifax, N.S. *
Abstract: The chemical and physical properties of water samples collected from 3 lakes and 7 rivers are presented.

Kerekes, J.J., S. Beauchamp and W. Tordon, 1982. **Limnological Data, 1978, 1979, 1980. LRTAP Calibrated Lake Basin Studies, Kejimkujik National Park.** Data Report. Canadian Wildlife Service, Halifax, N.S. *
Abstract: Selected limnological measurement data for 3 lake basins and major rivers are presented.

Kerekes, J.J., S. Beauchamp and R. Trucco, 1982. **Phytoplankton Data, 1978, 1979, 1980. LRTAP Calibrated Lake Basin Studies, Kejimkujik National Park.** Data Report. Canadian Wildlife Service, Halifax, N.S. *
Abstract: The results of analysis of phytoplankton samples collected from 3 lakes are presented.

Kerekes, J. and J. Dale, 1985. **Bibliography, Kejimkujik Calibrated Catchments Program (Nova Scotia) on The Aquatic and Terrestrial Effects of the Long-Range Transport of Air Pollutants.** Environment Canada, Canadian Wildlife Service, c/o Biology Department, Dalhousie University, Halifax, N.S.

Abstract: This bibliography lists reports and publications dealing with the effects of the long range transport of air pollutants on the Kejimkujik, N.S. calibrated catchments.

Kerekes, J., B. Freedman, G. Howell and P. Clifford, 1984. **Comparison of the characteristics of an acidic eutrophic, and an acidic oligotrophic lake near Halifax, Nova Scotia.** Water Poll. Res. J. Canada, 19 (1): 1-10.

Abstract: The chemical and biological characteristics of two lakes near Halifax, N.S., are reported. Both lakes have been acidified as a result of the oxidation of exposed sulphide minerals in their drainage basins.

Kerekes, J.J. and G. Howell, 1983. **Effects of acidic precipitation on aquatic bird populations in Atlantic Canada: I. Investigations in Nova Scotia in 1982. Progress Report.** Canadian Wildlife Service, Halifax, N.S.

Abstract: Twenty-five waterbodies representing a wide range of aquatic habitat with respect to waterfowl productivity and sensitivity to acid precipitation were sampled in Nova Scotia in 1982.

Kerekes, J.J. and G. Howell, 1983. **Methods and Results May Change but Ion Balance Remains (Ion Balances with the Methyl Thymol Blue and Ion Chromatography Methods in Kejimkujik Waters).** Ms. Report. Canadian Wildlife Service, Halifax, N.S.

Abstract: This report compares the ion balances obtained with two sulphate methods along with and without the estimated organic anion concentrations.

Kerekes, J., G. Howell, S. Beauchamp and T. Pollock, 1982. **Characterization of three lake basins sensitive to acid precipitation in central Nova Scotia (June, 1979, to May, 1980).** Int. Revue ges. Hydrobiol. 67: 679-694.

Abstract: The response of major ions to atmospheric loading in the three lake basins lying on Devonian granite in central Nova Scotia has been investigated since 1978. The lake waters are very soft, the calcium ion concentrations are among the lowest in the world and the annual mean hydrogen ion concentrations ranged from pH 5.4 to 4.5.

Kerekes, J., G. Howell and T. Pollock, 1984. **Problems associated with sulphate determination in colored, humic waters in Kejimkujik National Park, Nova Scotia (Canada).** Verh. Internat. Verein. Limnol. 22: 1811-1817.

Abstract: The bias that may result from using the methol thymol blue method of sulphate determination in colored waters is discussed.

Kerekes, J. and T. Pollock, 1983. **Comment on the Interpretation of the Sulphate Ions in Watt *et al.*, 1983, 'Evidence of acidification on some Nova Scotian rivers and its impact on Atlantic salmon, *Salmo salar*.'** Can. J. Fish. Aq. Sci., 40: 2260-2261.

Abstract: It is argued that the sulphate data obtained by applying the methyl thymol blue method to coloured waters are biased and should not be compared to results obtained using other techniques.

Knox, D., 1981. **Macroinvertebrate baseline characterization of three lakes in Kejimkujik National Park, Nova Scotia.** Unpublished report. Canadian Wildlife Service, Halifax, N.S.

Abstract: Three lakes in Kejimkujik National Park were sampled for benthic macroinvertebrates during the summer of 1980.

Lacroix, G.L., D.J. Gordon and D.J. Johnston, 1985. **Effects of Low Environmental pH on the Survival, Growth, and Ionic Composition of Postemergent Atlantic Salmon (*Salmo salar*).** Can. J. Fish. Aq. Sci., 42 (4): 768-775.

Abstract: Salmon fry were reared during their early feeding phase in water (pH 5.0) of the Westfield River, Nova Scotia, by being held in flow-through tanks and fed a hatchery diet. Bioassays were also conducted in river water treated with limestone (pH 6.1). Cumulative mortality in tanks at pH 5.0 was 70% after 30 days, and 4% at pH 6.1. Fry at pH 5.0 were inactive, ate little, and at death were emaciated. Surviving fry at pH 5.0 were similar in growth and other parameters to those at pH 6.1.

Lane, P.A. and A.C. Blouin, 1984. **Plankton of an acid-stressed lake (Kejimkujik National Park, Nova Scotia, Canada). Part 3. Community network analysis.** Verh. Internat. Verein. Limnol. 22: 406-411.

Abstract: Evaluation of a pelagic food web by qualitative analysis using loop models is described using data from Beaverskin Lake. The core networks were found to have 16-19 variables and about 45 links, with a three-layer configuration and a detritus-rotifer subsystem. The acid enclosures were represented by the most deviant network measures of all core models.

Lane, P.A. and A.C. Blouin, 1985. **Qualitative analysis of the pelagic foodwebs of three acid-impacted lakes in Nova Scotia, Canada.** Int. Revue ges. Hydrobiol. 70: 203-220.
Abstract: Loop models were fitted to data sets for 3 lakes in Kejimkujik National Park. The analysis illustrated which links are expected to remain resilient with increasing perturbation.

Lane, P.A., A.C. Blouin and T. Collins, 1982. **Plankton-nutrient interactions in Pebbleloggitch, Beaverskin and Kejimkujik Lakes (Kejimkujik National Park, Nova Scotia) in 1980 and 1981.** Dalhousie University Tech. Rep., 2 Vol. *
Abstract: A field program was conducted in 1980 and 1981 on 3 lakes in Kejimkujik National Park in order to improve baseline data for monitoring the effects of acid precipitation on plankton communities, to model these lakes using loop analysis, and to conduct a feasibility experiment on acidification and liming.

Lane, P.A., A.C. Blouin and K. Cook, 1981. **A comparison of three plankton communities in Kejimkujik National Park, Nova Scotia in 1980.** Dalhousie Univ. Tech. Rep., 2 Vol. *
Abstract: A sampling program was carried out in 1980 on three lakes in Kejimkujik National Park, Nova Scotia, in order to establish baseline plankton community data for comparing the lakes. This study is part of a larger one concerned with the effects of acid precipitation on Nova Scotian Lakes.

Lane, P.A., A.C. Blouin and K. Cook, 1981. **Distribution and abundance of zooplankton in three lakes in Kejimkujik National Park, Nova Scotia.** Canadian Wildlife Service, Halifax, N.S. *
Abstract: A zooplankton sampling program was carried out on three lakes in Kejimkujik National Park in order to establish baseline community data. Knowledge of their dynamics can enhance our understanding of whole lake responses to external perturbations such as acid precipitation and nutrient enrichment.

Lucas, A.E. and D.W. Cowell, 1984. **Regional assessment of sensitivity to acidic deposition for eastern Canada.** Chapter 6 in: Geological Aspects of Acid Deposition. Ed. by J.I. Teasley, Butterworth Publishers, Stoneham, Mass., pp. 113-129.
Abstract: This chapter presents a regional sensitivity assessment of surface waters in eastern Canada. The interpreted sensitivity is based on the potential for soils and bedrock, in combination, to reduce the acidity of acidic deposition before its entry into the aquatic regime.

Machell, J.R., J.F. Wiltshire and R. Donald, 1983. **The Effect of Halifax Air Emissions on the Water Quality of Thirty-Six Halifax Area Lakes, 1980.** Environment Canada, Rep. EPS-5-AR-84-2.

Abstract: A single set of water samples was collected from 36 undisturbed lakes within 10-70 Km of Halifax in June of 1980. Higher sulphate levels and lower gran alkalinity related to distance from the urban area was shown for lakes within 30 Km of the city. This effect was most pronounced east of the urban area.

Machell, J.R., J.F. Wiltshire, D.B. Walter and R. Donald, 1984. **A Study of Acidification in Seven Lakes in Mainland Nova Scotia 1979-1981.** Environmental Protection Service, Environment Canada, Dartmouth, N.S.

Abstract: This study reports water quality data collected from 7 lakes in mainland Nova Scotia during October 1979 to October 1981. Gran alkalinity and pH data are higher than the previously reported 1979 summer data, although summer pH values lower than historical levels are reported in four of the poorly buffered lakes.

Ogden, J.G., III, 1982. **Seasonal Mass Balance of Major Ions in Three Small Watersheds in a Maritime Environment.** Water, Air, and Soil Pollution, 17: 119-130.

Abstract: Three watersheds have been monitored for major ion chemistry of precipitation input and streamflow from May 1977 to November 1978. More than 200 precipitation input and streamflow samples were analyzed for Na, K, Ca, Mg, chloride and sulphate, as well as pH, conductivity, alkalinity, and compared to similar studies at Hubbard Brook, New Hampshire, U.S.A., and Kejimkujik National Park, Nova Scotia.

Oliver, B.G. and G. Slawych, 1982. **The organic contribution to the acidity of natural waters.** Env. Canada, National Water Research Institute, Burlington, Ont.

Abstract: The dissociation behaviour of organic acids extracted from natural water samples was studied in detail. A good approximation of the sample's organic acid content could be made from its dissolved organic carbon concentration.

Oliver, B.G., E.M. Thurman and R.L. Malcolm, 1983. **The contribution of humic substances to the acidity of colored natural waters.** Geochimica et Cosmochimica Acta, 47: 2031-2035.

Abstract: An operationally defined carboxyl content of humic substances extracted from rivers, streams, lakes, wetlands, and groundwaters throughout the United States and Canada is reported. Dissociation of the humics varied in a predictable manner with pH. The ionic balances of three highly colored Nova Scotia rivers were estimated.

Percy, K.E. and J.J. Kerekes (eds.), 1981. **Kejimkujik calibrated catchments program on the aquatic and terrestrial effects of the long-range transport of air pollutants for 1980-81.** Environment Canada, Atlantic Region.

Abstract: The Kejimkujik Calibrated Lake Catchments Program is one of five lake catchment studies established to study the effects of acid rain in sensitive receptor ecosystems in Canada. The purpose of this report is to compile and outline the various studies on-going in the Kejimkujik lake catchments in Nova Scotia in 1980/81.

Percy, K.E. and J.J. Kerekes (eds.), 1982. **Kejimkujik watershed study on the aquatic and terrestrial effects of the long-range transport of air pollutants for 1982-83.** Environment Canada, Atlantic Region.

Abstract: This report is a collection of study outlines comprising the 1982/83 activities of the various agencies involved in the Kejimkujik Watershed Study.

Peterson, R.H. and H.H.V. Hord (eds.), 1983. **1983 Workshop on Acid Rain.** Can. Tech. Rep. Fish. Aq. Sci. No. 1213. Department of Fisheries and Oceans, St. Andrews, N.B. *

Abstract: This report is a record of the papers presented at a workshop organized to review the results of research on acid rain carried out during 1982 under the aegis of the Fisheries and Environmental Sciences Division of the Fisheries Research Branch, Scotia-Fundy Region, Department of Fisheries and Oceans.

Peterson, R.H., D.J. Martin-Robichaud and J.J. Kerekes, 1983. **Age-size relationships and food habits of fish sampled from the Kejimkujik calibrated watershed.** Can. Ms. Rep. Fish. Aq. Sci., No. 1743.

Abstract: Food habits and age-size relationships of fish from the three lakes of the Kejimkujik calibrated watershed study (Nova Scotia) are compared with these parameters for the same species in less acidic New Brunswick lakes.

Rao, S.S., L. Bhaskar and A.A. Jurkovic, 1982. **Microbiological studies of some watersheds receiving acid precipitation in Canada.** Manuscript No. 37-AMD-5-82-SR. Inland Waters Directorate, National Water Research Inst., Environment Canada, Burlington, Ont. *

Abstract: This report summarizes bacteriological data collected during 1981/82 in the Turkey Lakes watershed (Ontario) and the Kejimkujik watershed (N.S.). Laboratory studies indicated that acid stress stresses microbial populations.

Ryan, P.M. and D. Wakeham, 1984. **An Overview of the Physical and Chemical Limnology of the Experimental Ponds Area, Central Newfoundland, 1977-82.** Can. Tech. Rep. Fish. Aq. Sci. No. 1320.

Abstract: Physical and chemical limnological data were obtained from three small, brown-water lakes and their tributary streams in the Experimental Ponds Area at the headwaters of the Gander River system, central Newfoundland. Annual and seasonal variations in water quality are described in the report.

Schwinghamer, P., 1975. **Factors related to trophic state of lakes in four Atlantic National Parks.** M.Sc. thesis, Dalhousie University, Halifax, N.S. *

Abstract: Fifty-eight lakes were investigated to determine factors which influence indices of trophic state of lakes in the Atlantic Region National Parks. The lakes are located in Gros Morne and Terra Nova National Parks, Newfoundland; Kejimkujik National Park, Nova Scotia; and Fundy National Park, New Brunswick. Several variables related to lake morphometry, thermal regimes, water chemistry, transparency, and phytoplankton biomass were examined.

Scruton, D.A., 1983. **A survey of headwater lakes in insular Newfoundland, with special reference to acid precipitation.** Can. Tech. Rep. Fish. Aq. Sci. No. 1195.

Abstract: One hundred and nine small headwater lakes on the island of Newfoundland were surveyed from August 16 to October 18, 1981. Lakes were sampled for morphometry, water chemistry, zoo- and nanno-plankton, sediments, benthos, and fish. Lake pH varied from 4.90 to 8.39 with ten lakes having a pH of less than 5.50.

Scruton, D.A., 1983. **The end of the funnel; Newfoundland and Labrador freshwaters in relation to acidification.** Presented at the Annual Canadian Conference for Fisheries Research (CCFFR), Winnipeg, Manitoba.

Abstract: A sample of 109 headwater lakes in insular Newfoundland were studied in 1981 to determine their chemical and biological status and sensitivity with respect to acid precipitation. These lakes were found to be highly sensitive and showed varying levels of response at present deposition rates. Water quality was monitored on 22 Atlantic salmon rivers in insular Newfoundland on a monthly basis from May 1981 to May 1982. Several rivers demonstrated extreme sensitivity to acid deposition and depressions of pH in association with high runoff were evident in most rivers.

Scruton, D.A., 1984. **A compilation of water quality data for Newfoundland and Labrador for the years 1972-80.** Can. Data Rep. Fish. Aq. Sci. No. 441.

Abstract: Available surface water quality data for insular Newfoundland and Labrador, for the years 1972-80, and from a diverse array of sources have been assembled in this document. A listing of water quality stations (1060 stations in insular Newfoundland and 410 stations in Labrador) and data are included. A statistical summary and spatial distribution of the data are presented.

Scruton, D.A., 1984. **A survey of selected lakes in Labrador, with an assessment of lake status and sensitivity in relation to acid precipitation.** Can. Tech. Rep. Fish. Aq. Sci. No. 1296.

Abstract: One hundred and thirty lakes in Labrador were surveyed from August 16 to October 20, 1982 as part of the Department of Fisheries and Oceans' National Inventory Survey (NIS). Ninety-five lakes were sampled for morphometry, water chemistry, zoo- and nanno-plankton, and fish. Thirty-five lakes were surveyed for water chemistry only.

Scruton, D.A., 1984. **DFO's National Inventory Program and results of lake surveys conducted in the Newfoundland Region.** Dept. of Fisheries and Oceans, St. John's, Nfld. (Presented to the Royal Society of Canada, in Toronto, Ont.)

Abstract: This report presents an overview of Fisheries and Oceans' National Inventory Survey (NIS) of acid sensitive lakes in Eastern Canada and subsequently presents the Newfoundland inventory studies as an example of the regional approach to this survey program.

Scruton, D.A., 1984. **The potential for acidification of Newfoundland and Labrador fresh waters and implications for resident fish: A summary of Fisheries and Oceans research activities in the Newfoundland Region: 1981 to 1984.** A brief delivered to the Parliamentary Subcommittee on Acid Rain of the Standing Committee on Fisheries and Forestry, St. John's, Newfoundland.

Abstract: This report presents an overview of Fisheries and Oceans' research activities on acid rain in the Newfoundland region from 1981 to 1984.

Scruton, D.A., 1985. **Acid rain studies and limnological characterization of lakes in Newfoundland.** Presented to the Annual Canadian Society of Environmental Biologists Meeting, St. John's, Nfld.

Abstract: Descriptions and comparisons of lakes which comprised large scale lake inventory programs are presented. Chemical data from the study lakes are examined in relation to acid sensitivity indices and for acidification effects using widely applied empirical models. Fish species assemblages from the study lakes are described and compared between Newfoundland and Labrador.

Scruton, D.A., 1986. **Spatial and temporal variability in the water chemistry of Atlantic salmon rivers in insular Newfoundland. An assessment of sensitivity to and effects from acidification and implications for resident fish.** Can. Tech. Rep. Fish. Aq. Sci. (In press). *

Abstract: Twenty-two acid-sensitive Atlantic salmon rivers were sampled monthly from May 1981 to May 1982 to evaluate susceptibility to, and effects from, acid deposition. The timing and magnitude of pH depressions were evaluated with respect to potential toxicity for resident Atlantic salmon and brook trout.

Sexsmith, W., 1981. **Susceptibility to Acidification - Some Lakes and Rivers in West-Central New Brunswick.** Information Report No. I-8103. Environmental Services Branch, Environment New Brunswick, Fredericton, N.B.

Abstract: The chemistry and geology of six lakes and two rivers in west-central New Brunswick are discussed in terms of their buffering capacity. Three lakes are considered to be sensitive to acidification.

Spavold Tims, A.J. and G.R. Hawkins, 1985. **The Sensitivity of New Brunswick Lakes and Rivers to Acidification.** Environment New Brunswick, Fredericton, N.B. Presented at the International Symposium on Acidic Precipitation, Muskoka, Ont., Sept. 1985.

Abstract: A study was conducted to identify New Brunswick lakes and rivers susceptible to the effects of acidic precipitation. The sensitivities of 107 lakes and 140 rivers to acidic inputs were classified. Waters sampled in the southwestern and north-central parts of the province were most susceptible to acid rain.

Stewart, C. and B. Freedman, 1981. **A survey of aquatic macrophytes in three lakes in Kejimkujik National Park, Nova Scotia. 1981 Progress Report.** Dalhousie University, Halifax, N.S.

Abstract: Preliminary data are presented which describe the aquatic macrophyte communities of three lakes in Kejimkujik National Park, in south-central Nova Scotia.

Stewart, C., B. Freedman and J. Dale, 1980. **A survey of aquatic macrophytes in three lakes in Kejimkujik National Park, Nova Scotia. 1980 Progress Report.** Dalhousie University, Halifax, N.S.

Abstract: Preliminary data are presented which describe the aquatic macrophyte communities of three lakes in Kejimkujik National Park, in south-central Nova Scotia.

Thompson, M.E., 1980. **Acidification of east coast rivers: A geochemical evaluation of some NAQUADAT data.** National Water Research Inst., Environment Canada, Burlington, Ont. *

Abstract: Atmospheric loadings to river basins in Nova Scotia and Newfoundland were estimated from river chemistry data. Apparently, hydrogen ion loading increased until 1973 then decreased.

Thompson, M.E., 1982. **The cation denudation rate as a quantitative index of sensitivity of Eastern Canadian rivers to acidic atmospheric precipitation.** Water, Air and Soil Pollution, 18: 215-226.

Abstract: Data for rivers in Nova Scotia and Newfoundland were used to develop a model that relates the cation denudation rate of a watershed, the atmospheric load of excess sulphate, and the pH of the river.

Thompson, M.E. and E.B. Bennett, 1980. **Variations in the degree of acidification of river waters observed in Atlantic Canada.** Proceedings OECD-EPA Symp. on Lake Protection and Restoration, Portland, Maine, pp. 453-456.

Abstract: This report deals with the changes in river water chemistry attributed to acid loading, the year-to-year variations observed and the fraction of acidification associated with sulphate deposition.

Thompson, M.E., F.C. Elder, A.R. Davis and S. Whitlow, 1980. **Evidence of acidification of rivers of Eastern Canada.** Proc. Int. Conf. Ecol. Impact Acid Precip., Norway, 1980, pp. 244-245.

Abstract: Evidence of acidification of some rivers in Nova Scotia and Newfoundland since 1955 is presented.

Thompson, M.E. and M.B. Hutton, 1982. **The Mersey River, Nova Scotia 1954/55 and 1971 - A critical evaluation of the earlier data.** National Water Res. Inst., Environment Canada, Burlington, Ont.

Abstract: The 1954/55 chemical data for the Mersey River, N.S., were evaluated and revised, making it possible to reconstruct an approximation of the river's actual status at the time.

Thompson, M.E. and M.B. Hutton, 1985. **Sulfate in lakes of Eastern Canada: calculated yields compared with measured wet and dry deposition.** Water, Air and Soil Pollution, 24: 77-83.

Abstract: Sulfate yields in eastern Canada are compared with wet and dry deposition data, indicating that most of the sulfate in these lakes is from atmospheric deposition.

Tordon, R.J., 1980. **The collection of limnological and heavy metal samples in three lakes in Kejimkujik National Park, Nova Scotia.**

Abstract: Parameters measured at various sites in three lakes in Kejimkujik National Park, Nova Scotia, in 1980 are presented.

Underwood, J.K., R.F. McCurdy and D. Borgal, 1983. **Effects of color interference on ion balances in Atlantic Canada lake waters using methylthymol blue sulphate results: Some preliminary observations.** Nova Scotia Dept. of Environment, Halifax, N.S. (Included in: Kerekes (ed.), 1983.)

Abstract: An evaluation of the strength of the color interference from humic substances is presented.

Underwood, J.K., J.G. Ogden, III, H.H. Vaughan and J.J. Kerekes, (In press). **Acidification of Nova Scotia Lakes III: Atmospheric Deposition of SO_4 and NO_3 and Effects on Rural and Urban Lakes.** Water, Air, and Soil Pollution.

Abstract: This paper describes a gradient of SO_4 in precipitation and lakes across the province and between rural and urban centres. Precipitation and lake data for NO_3 and hydrogen ion are also presented.

Underwood, J.K., H.H. Vaughan, J.G. Ogden, III and C.G. Mann, 1982. **Acidification of Nova Scotia Lakes II: Ionic Balances in Dilute Waters.** AMS/CMOS Conference, SUNY-Albany, April 1981.

Abstract: This paper postulates that colour must somehow be taken into consideration when developing ion budgets.

Vaughan, H.H., J.K. Underwood, J.J. Kerekes and J.G. Ogden, III, 1983. **Acidification of Nova Scotia Lakes IV: Response of Diatom Assemblages in Rural Lakes.** Presented as a poster at the September 1983 meeting of the Royal Society of London - Ecological Effects of Deposited Sulphur and Nitrogen Compounds.

Abstract: This paper describes diatom evidence for acidification in clear water rural lakes.

Vaughan, H.H., J.K. Underwood and J.G. Ogden, III, 1982. **Acidification of Nova Scotia Lakes I: Response of Diatom Assemblages in the Halifax Area.** Water, Air, and Soil Pollution, 18: 353-361. (First presented at the AMS/CMOS Conference in SUNY-Albany, April 1981.)

Abstract: This paper describes the diatom evidence for recent acidification in the Halifax area.

Water Quality Branch, 1981. **LRTAP Sensitivity Sampling of Labrador - Summer 1980.** Environment Canada, Water Quality Branch, Atlantic Region. Report 81-WQB-1.

Abstract: This document is a compilation of the analytical results of surface water samples taken at 28 sites in Labrador, with an interpretation of the results. The data suggest that, in most of Labrador, the waters are very poorly buffered against acid precipitation.

Watt, W.D., 1981. **Present and Potential Effects of Acid Precipitation on the Atlantic Salmon in Eastern Canada.** Acid Rain and the Atlantic Salmon, IASF Special Publication Series #10.

Abstract: This report presents data on the effects of river acidity on the Atlantic salmon.

Watt, W.D., G.J. Farmer and W.J. White, 1983. **Studies on the use of limestone to restore Atlantic salmon habitat in acidified rivers.** Lake and Reservoir Management, Proceedings of the Third Annual Conference of the North American Lake Management Society, Knoxville, Tennessee.

Abstract: Liming experiments were conducted using two approaches (instream placements and headwater lake neutralization). The problems of environmental chemistry and logistics seriously limit the practicality of using limestone to mitigate the acidification of Atlantic salmon rivers.

Watt, W.D., C.D. Scott and S. Ray, 1979. **Acidification and other chemical changes in Halifax County lakes after 21 years.** Limnol. Oceanogr., 24 (6): 1154-1161.

Abstract: In 16 lakes near Halifax, the pH levels have declined since 1955, largely due to local pollution.

Watt, W.D., C.D. Scott and W.J. White, 1983. **Evidence of acidification on some Nova Scotian rivers and its impact on Atlantic Salmon, *Salmo salar*.** Can. J. Fish. Aq. Sci. 40: 462-473.

Abstract: In the geologically sensitive areas of Nova Scotia, river pH's have fallen significantly over the past 27 years. On average, 73% of the increase in acid is attributable to increased SO_4. In rivers presently at mean annual pH's less than 4.7, the Atlantic salmon runs have disappeared, whereas rivers presently at pH greater than 5.0 show no significant trend in angling returns.

White, W.J., W.D. Watt and C.D. Scott, 1981. **An experiment on the feasibility of rehabilitating acidified Atlantic salmon habitat in Nova Scotia by the addition of lime.** Fisheries, 9 (1): 25-30.

Abstract: The experiment showed that, although it is feasible to add lime to headwater lakes to regulate fluctuations in the pH of rivers and to maintain the pH at levels favourable to Atlantic salmon, lime must be added at frequent intervals to lakes in Nova Scotia because they are small and have rapid rates of flushing.

Wiltshire, J.F. and J.R. Machell, 1981. **A Study of Acidification in Sixteen Lakes in Mainland Nova Scotia and Southern New Brunswick.** Preliminary report. Environment Canada, Report EPS 5-AR-81-4.

Abstract: During the summer of 1979 water quality data were collected from 16 lakes in mainland Nova Scotia and southern New Brunswick. pH data suggest a substantial decline in nine lakes from previously reported 1958 values. Lakes within 30 Km of Halifax showed the greatest declines.

Atmospheric Environment Service, 1982. **CANSAP Data Summary 1977-1978.** Atmospheric Environment Service, Downsview, Ont.
Abstract: The precipitation chemistry data presented in this document were generated by the Canadian Network for Sampling Precipitation (CANSAP) during its first two years of operation. Atlantic Region stations are: N.B.: Charlo, Saint John. N.S.: Kejimkujik (June-Dec. 1978), Sable Island, Shelburne, Truro. NFLD: Gander, Goose, Stephenville.

Atmospheric Environment Service, 1982. **CANSAP Data Summary 1979-1980.** Atmospheric Environment Service, Downsview, Ont.
Abstract: The precipitation chemistry data presented in this document were generated by the Canadian Network for Sampling Precipitation (CANSAP) during its third and fourth years of operation. A change in sampling protocol on January 1, 1980 to event compositing is described. Atlantic Region stations are: N.B.: Acadia FES, Charlo, Saint John. N.S.: Kejimkujik, Sable Island, Shelburne, Truro. NFLD: Gander, Goose, Stephenville.

Atmospheric Environment Service, 1982. **CANSAP Data Summary 1981.** Atmospheric Environment Service, Downsview, Ont.
Abstract: The precipitation chemistry data presented in this document were generated by the Canadian Network for Sampling Precipitation (CANSAP) during its fifth year of operation. Atlantic Region stations are: N.B.: Acadia FES, Charlo, Saint John. N.S.: Kejimkujik, Sable Island, Shelburne, Truro. NFLD: Gander, Goose, Stephenville.

Atmospheric Environment Service, 1983. **CANSAP Data Summary 1982.** Atmospheric Environment Service, Downsview, Ont.
Abstract: The precipitation chemistry data presented in this document were generated by the Canadian Network for Sampling Precipitation (CANSAP) during its sixth year of operation. Atlantic Region stations are: N.B.: Acadia FES, Charlo, Saint John. N.S.: Kejimkujik, Sable Island, Shelburne, Truro. NFLD: Gander, Goose, Stephenville.

Atmospheric Environment Service, 1984. **CANSAP Data Summary 1983.** Atmospheric Environment Service, Downsview, Ont.

Abstract: The precipitation chemistry data presented in this document were generated by the Canadian Network for Sampling Precipitation (CANSAP) during its seventh year of operation. In eastern Canada, most of the CANSAP stations were closed at the end of 1982, making room for the new Canadian Air and Precipitation Monitoring Network (CAPMoN). Atlantic Region stations operating in CANSAP in 1983 are: Acadia FES, N.B.; Kejimkujik, N.S.; Truro, N.S.; Stephenville, NFLD.

Atmospheric Environment Service, 1985. **Bibliography: Atmospheric Sector of the Federal Long-Range Transport of Air Pollutants (LRTAP) Program 1973-1985.** A.E.S. LRTAP Scientific Program. Report AQRB-85-M-004. Atmospheric Environment Service, Downsview, Ont.

Abstract: The LRTAP research and monitoring programs conducted by A.E.S. comprise the atmospheric sector of the overall federal scientific program. This bibliography is evidence of the atmospheric scientific program effort applied by A.E.S. during the past decade.

Barrie, L.A., K. Anlauf, H.A. Wiebe and P. Fellin, 1984. **Acidic Pollutants in Air and Precipitation at Selected Rural Locations in Canada.** Paper presented at the American Chemical Society Symposium on Acid Rain, March 28, 1982. Chapter 2 in 'Deposition both Wet and Dry' (Vol. 4 in 'Acid Precipitation Series', Ed. J. Teasley). Ann Arbor Science.

Abstract: Results of daily air and precipitation chemistry monitoring at five rural locations in eastern Canada (Canadian APN network) since November 1978 are presented. The Atlantic Region station is at Kejimkujik, N.S. Several topics are discussed, including the geographical and temporal variation of observed concentrations, the frequency of pollution episodes, the relative importance of wet and dry deposition and the origin of pollutants.

Barrie, L.A. and A. Sirois, 1982. **An Analysis and Assessment of Precipitation Chemistry Measurements made by CANSAP (The Canadian Network for Sampling Precipitation): 1977-1980.** Atmospheric Environment Service, Downsview, Ont. Report AQRB-82-003-T.

Abstract: The usefulness and limitations of CANSAP observations are addressed. Tables and maps of mean concentrations and annual depositions of major ions from 1977 to 1980 are presented and discussed. Seasonal variations are presented.

Barrie, L.A. and A. Sirois, 1985. **Wet and Dry Deposition of Sulphates and Nitrates in Eastern Canada: 1979-1982.** Submitted to Water, Air, and Soil Pollution.

Abstract: This paper summarizes the results of four years of measurements from 1979 to 1982 in terms of wet and dry deposition of sulphate and nitrate to an area of 100 km radius around each of six rural locations in eastern Canada. One site is in the Atlantic provinces (Kejimkujik, N.S.). Dry deposition accounts for about 20% of the total sulphate and nitrate deposition at Kejimkujik.

Barrie, L.A., H.A. Wiebe and K. Anlauf, 1984. **Results of the Canadian Air and Precipitation Monitoring Network APN: 1982.** Atmospheric Environment Service, Downsview, Ont. Report AQRB-84-005-T.

Abstract: The air and precipitation monitoring network (APN), in operation since November 1978, has been used to obtain information on the quality of air and precipitation on a daily basis at regionally representative locations in Canada. Covering the period January to December 1982, this report presents the results from eight sites. The Atlantic Region stations are Kejimkujik, N.S., and Bay d'Espoir, NFLD.

Barrie, L.A., H.A. Wiebe, K. Anlauf and P. Fellin, 1982. **Results of the Canadian Air and Precipitation Monitoring Network APN: July 1980 to December 1981.** Atmospheric Environment Service, Downsview, Ont. Report AQRB-82-009-T.

Abstract: The air and precipitation monitoring network (APN), in operation since November 1978, has been used to obtain information on the quality of air and precipitation on a daily basis at regionally representative locations in Canada. Covering the period July 1980 to December 1981, this report presents the results from six sites. The Atlantic Region station is Kejimkujik, N.S.

Barrie, L.A., H.A. Wiebe, P. Fellin and K. Anlauf, 1980. **APN, The Canadian Air and Precipitation Monitoring Network: A Description and Results for November 1978 to June 1979.** Atmospheric Environment Service, Downsview, Ont. Report AQRB-80-002-T.

Abstract: This network is described in detail and results for the first eight months of operation are reported. The daily mean concentration of particulate major ions and sulphur dioxide in air as well as the acidity and major ion content of daily precipitation samples are measured. The Atlantic Region station is Kejimkujik, N.S., which began operation in May 1979.

Barrie, L.A., H.A. Wiebe, P. Fellin and K. Anlauf, 1981. **Results of the Canadian Air and Precipitation Monitoring Network APN: July 1979 to June 1980.** Atmospheric Environment Service, Downsview, Ont. Report AQRB-81-026-T.

Abstract: The air and precipitation monitoring network (APN), which began operation in November 1978, has continued to yield information on the concentration of acid-related substances in daily air and precipitation samples. Covering the period July 1979 to June 1980, this report presents results from five Canadian sites. The Atlantic Region station is Kejimkujik, N.S.

Chung, Y.S., 1978. **The distribution of atmospheric sulphates in Canada and its relationship to long-range transport of air pollutants.** Atmospheric Environment, 12: 1471-1480.

Abstract: Analyses of the distribution of airborne sulphates in Canada have been carried out using data obtained during April - May 1975. High values were frequently observed in eastern Canada. Generally, values recorded in the Atlantic Provinces were lower than the values observed in Ontario. Air-parcel trajectory analyses show that high sulphate levels were often associated with S-SW airflows on the rear side of a warm moist air mass.

Curtis, D.S., 1975. **Acid Precipitation with Special Reference to the Relationship between Acidity of Precipitation and Wind Direction in Central New Brunswick.** B.Sc. in Forestry Thesis, University of New Brunswick, Fredericton, N.B.

Abstract: This thesis attempts to define a relationship between pH of precipitation at the Nashwaak Experimental Watershed Project in Central New Brunswick, and wind directions during rainfall. The analysis seems to point to the occurrence of low pH values in precipitation samples when winds originate from the southwest quadrant.

Estey, M., 1981. **New Brunswick Ozone Study 1980.** Information Report No. I-8102. Pollution Control Branch, Environment New Brunswick, Fredericton, N.B.

Abstract: Trajectory analyses were performed on ozone episodes measured in Saint John, New Brunswick. Typical patterns associated with these episodes are described and the relative effects of short range and long range transport discussed.

Ferland, M. and L. Hulett, 1983. **Standardization of measurement and collection techniques.** IN: Proceedings. Symposium on Monitoring and Assessment of Airborne Pollutants with Special Emphasis on Long-Range Transport and Deposition of Acidic Materials and Workshop on Air and Precipitation Monitoring Networks. Ottawa, Canada, 30 Aug. - 3 Sept., 1982. Eds: R.C. Pierce, D.M. Whelpdale, M.G. Sheffer. NRCC No. 20642, pp. 453-456. National Research Council of Canada, Ottawa, Ont.

Abstract: The need for standardization of networks involved in determining acid deposition is discussed in this working group's report. The implementation of a comprehensive classification system for each monitoring station is proposed by the working group to identify different procedures and techniques in the various networks.

Herman, F.A. and E. Gorham, 1957. **Total Mineral Material, Acidity, Sulphur and Nitrogen in Rain and Snow at Kentville, Nova Scotia.** Tellus, 9 (2): 180-183.

Abstract: Analysis of total ash, sulphur, pH, ammonia and nitrate nitrogen have been made on 23 monthly precipitation samples and 17 individual snow samples collected between June 1952 and May 1954 at Kentville, Nova Scotia, in a predominately agricultural area. Average pH was 5.7.

Kozak, J.H., 1983. **Coal: The Acid Rain Question.** IN: Energy Options for Atlantic Canada, ed. M. Conley and G.R. Daborn, Formac Publishing Co., pp. 99-106.

Abstract: A review is given of the potential atmospheric impacts of the increased use of coal for energy generation in the Atlantic Region, including local air quality, long range transport of air pollutants and potential global impacts.

Louie, P.Y.T., K. Johnstone and L.A. Barrie, 1984. **Acidic Snowmelt Shock Potential Model for Basin Studies.** Atmospheric Environment Service, Downsview, Ont. Presented at the Canadian Hydrology Symposium '84, Quebec City, Que.

Abstract: One of the environmental concerns of long range transport and deposition of atmospheric pollutants is the accumulation of these pollutants in the snowpack during periods of below freezing temperatures and their sudden concentrated release into the streams and lakes during periods of melt. A simple snowpack water and chemistry budget model has been developed. The model provides time series of melt amounts and the pollutant concentration of the snowpack and of the melt water.

Machell, J.R., O. Vaidya and D.B. Walter, 1982. **The Effects of Halifax Emissions on Metal Concentrations in Epiphytic Lichen *Usnea*.** Environment Canada, Report EPS-AR-83-4.
Abstract: The levels of ten metals in the epiphyte *Usnea* from fourteen sites 4-75 Km east and west of Halifax are reported. Elevated concentrations of V and Ni which show a significant relationship with distance from the urban area were recorded. The increase in these metals was related to local urban air emissions from the combustion of heavy fuel oils.

MacKay, K.T., 1975. **The Industrial Areas of Cape Breton as Sources of Cations and Anions to the Surrounding Ecosystem.** Report to the St. Francis Xavier University Council for Research, Antigonish, N.S.
Abstract: Results from the analysis of weekly samples of rain water collected around Sydney in 1972 and 1973 are presented as a first step toward understanding the contribution of various chemical species to the area surrounding the industrial Cape Breton region.

Mahendrappa, M.K., 1985. **Precipitation chemistry affected by differences in location of collection sites and storage methods.** Atmospheric Environment, 19: 1681-1684.
Abstract: An investigation was carried out to evaluate rigorously the possible differences in measured concentrations of hydrogen, nitrate, and sulphate ions in bulk precipitation samples that may be caused by variations in location of rain collectors and duration and temperature of storage.

Ogden, J.G., III, 1980. **Comparative composition of continental and Nova Scotian precipitation.** Proceedings of Int. Conf. Ecol. Impact Acid Precip., Norway. Pp. 126-127.
Abstract: Five precipitation events associated with low pressure frontal systems moving from northeastern United States towards Nova Scotia have been collected and compared for differences in ionic composition.

Olson, M.P., E.C. Voldner and K.K. Oikawa, 1982. **A Computed Sulphur Budget for the Eastern Canadian Provinces.** Water, Air, and Soil Pollution, 18, 139-155.
Abstract: Sulphur budgets for Ontario, Quebec and the Atlantic Provinces have been computed using the Long-Range Transport of Air Pollutants model (LRTAP) which has been developed within the Atmospheric Environment Service of Canada. Meteorological data from 1978 and a North American SO_2 emissions inventory for 1970-1974 form the basic model input.

Shannon, J.D. and E.C. Voldner, 1982. **Estimation of Wet and Dry Deposition of Pollutant Sulfur in Eastern Canada as a Function of Major Source Regions.** Water, Air and Soil Pollution, 18, 101-104.

Abstract: The contributions of major anthropogenic source regions to wet and dry deposition of total S in eastern Canada are estimated for a winter month and a summer month with the ASTRAP model. Results indicate that the U.S. and Canada contribute approximately equal amounts to total S deposition in Canada.

Shaw, R.W., 1978. **Long range atmospheric transport and deposition of contaminants to the Atlantic Region.** Environmental Protection Service, Halifax, N.S. (Paper No. 17-2, 28th Canadian Chemical Engineering Conference, Halifax, N.S.)

Abstract: Evidence of the LRTAP phenomenon in the Atlantic Region is examined from past studies and from ongoing sampling programs.

Shaw, R.W., 1978. **The Long Range Transport and Deposition of Atmospheric Pollutants to Atlantic Canada.** Environmental Protection Service, Halifax, N.S. (Presented at the Symposia on Environmental Chemistry, Annual General Meeting, Chemical Institute of Canada - Atlantic Section).

Abstract: This paper describes the past work carried out in the Atlantic Region of Canada on the long range transport and deposition of sulphur compounds and the current work in the sampling and chemical analysis of both precipitation and aerosols.

Shaw, R.W., 1979. **Acid Precipitation in Atlantic Canada.** Environmental Science and Technology, 13 (4): 406-411.

Abstract: A review is given of SO_x and NO_x deposition in the Atlantic Region and a discussion on possible sources, effects and monitoring networks.

Shaw, R.W., 1979. **Estimated Amounts and Origins of Pollutants being Imported via the Atmosphere into Atlantic Canada.** Environmental Protection Service, Halifax, N.S. (Presented at the Conference on Water and Environmental Law, Halifax.)

Abstract: This paper reviews data with respect to the extent and severity of the atmospheric deposition of acidic compounds in Atlantic Canada and attempts to determine the origins of the substances being deposited. Acidification of one set of 16 lakes is also documented.

Shaw, R.W., 1982. **Deposition of Atmospheric Acid from Local and Distant Sources at a Rural Site in Nova Scotia.** Atmospheric Environment, 16 (2): 337-348.

Abstract: An analysis of local surface wind direction during the sampling of individual precipitation events at St. Margaret's Bay, a rural site in Nova Scotia, suggests that, during a one year sampling period, approximately 50% of the wet deposition of H^+ and SO_4 ions is due to SO_2 in Halifax, a city located 25 Km to the east.

Shaw, R.W., 1983. **A Climatological Model for Predicting Mesoscale Patterns of Acid Deposition.** Environmental Protection Service, Dartmouth, N.S. (Presented at the Canadian Meteorological and Oceanographic Society Congress, Banff, May 1983.)

Abstract: This paper describes a climatological model which gives mesoscale fields of concentration of sulphur dioxide, primary and secondary sulphate, as well as dry and wet deposition of sulphur.

Shaw, R.W., 1984. **The Atmosphere as Delivery Vehicle and Reaction Chamber for Acid Precipitation.** Chapter 3 in 'Meteorological Aspects of Acid Rain' (Vol. 1 in Acid Precipitation Series, Ed. J.I. Teasley). Ann Arbor Science.

Abstract: This chapter discusses the various roles of the atmosphere in the pathway of acidifying pollutants from source to receptor. Certain unresolved issues, such as our incomplete knowledge of the chemistry of sulphate formation and the relative importance of dry deposition, are discussed with respect to the measures that may be taken to mitigate the problem of acid precipitation.

Shaw, R.W., 1985. **Five Years of Observing Local Patterns of Sulphur Deposition around Halifax/Dartmouth, Nova Scotia.** Atmospheric Environment Service, Dartmouth, N.S. Submitted to Water, Air and Soil Pollution.

Abstract: Five years of sampling support earlier findings that sulphur dioxide emissions from Halifax/Dartmouth, Nova Scotia, cause wet sulphate deposition within 40 to 50 kilometres of the city to be twice regional values. The urban effect appears to have diminished somewhat during the five years (1979-1983), possibly because the urban emissions have decreased by 35% since 1980.

Sirois, A., 1983. **1981 The Canadian Network for Sampling Precipitation (CANSAP) Annual Report.** Atmospheric Environment Service, Downsview, Ont.

Abstract: This report gives tables and plots of the 1981 CANSAP data and adds some derived results to the basic data (such as, a quality control axis to assess the quality of the data). Tables and maps of the annual deposition are also included. No interpretation of the data is given.

Taylor, B.L., 1984. **Acid Rain and Snow at Kejimkujik, Nova Scotia.** Chinook, 6 (3): 79.

Abstract: The pH values of rain and snow at Kejimkujik for the first four months of 1984 are presented. Almost one-third of the precipitation events were strongly acidic, with a pH of 4.2 or less.

Taylor, B.L., 1984. **An Inventory of Precipitation Chemistry Stations in the Atlantic Provinces (Second Edition).** Atmospheric Environment Service, Bedford, N.S. Report MAES 12-84.

Abstract: Both past and currently operating precipitation chemistry stations in the Atlantic provinces are listed, with information given on location, period of operation, parameters measured, frequency of sampling, analysis laboratory, operating agency and official, data storage mode and instrumentation.

Taylor, B.L., 1985. **Atlantic Provinces Precipitation Chemistry Evaluation Project.** Atmospheric Environment Service, Bedford, N.S. Report MAES 3-85.

Abstract: The report assesses the precipitation chemistry stations operating in the Atlantic provinces during 1980-1982 and recommends changes to siting and procedures.

Thorburn, S.E., 1981. **The Long Range Transport of Air Pollutants into New Brunswick.** M. Eng. Thesis. University of New Brunswick, Fredericton, N.B.

Abstract: Results of trajectory analyses characterizing transport of ozone and aerosol sulphate into New Brunswick are presented. Elevated aerosol and ozone levels are shown to result partially from long range transport.

Underwood, J.K., 1979. **pH of precipitation and annual deposition of excess sulfate, acidity, and nitrate on Nova Scotia.** Nova Scotia Environment, Halifax, N.S. Presented at a Regional LRTAP Workshop (See: Atmospheric Environment Service, 1979).

Abstract: This paper presents initial results of a two year study of pH and of atmospheric deposition of acidity, sulfate and nitrate. The data indicate that nitric acid may have been more important than sulfuric acid in causing increases in acidity during the past 25 years.

Underwood, J.K., 1981. **Monitoring Acid Precipitation.** Proceedings of the Annual Technical Meeting, Air Pollution Control Association, Atlantic Canada Chapter, pp. 35-64.

Abstract: This review paper describes various techniques for measuring acidic precipitation.

Underwood, J.K., 1984. **An Analysis of the Chemistry of Precipitation in Nova Scotia 1977-1980.** Ph.D. Thesis. Technical University of Nova Scotia, Halifax, N.S.

Abstract: This thesis gives an evaluation of the chemistry of wet and dry atmospheric deposition collected in Nova Scotia over several years. It reviews the influence of the ocean, precipitation as a potential source of nutrients, a comparison between measured wet and dry fallout, and acidic deposition.

Underwood, J.K., J.G. Ogden, III, H.H. Vaughan and J.J. Kerekes, (In press). **Acidification of Nova Scotia Lakes III: Atmospheric Deposition of SO_4 and NO_3 and Effects on Rural and Urban Lakes.** Water, Air, and Soil Pollution.

Abstract: This paper describes a gradient of SO_4 in precipitation and lakes across the province and between rural and urban centres. Precipitation and lake data for NO_3 and hydrogen ion are also presented.

Underwood, J.K., D.H. Waller and D. Thirumurthi, 1984. **The influence of the ocean on the chemistry of precipitation in Nova Scotia.** C.W.R.S. Contribution #84-9. Presented at Canadian Hydrology Symposium, Laval University, Quebec.

Abstract: This paper describes the chemistry of Nova Scotian precipitation and how it is affected by sea salts. The effect rapidly disappears inland from the coast in a function that may be defined by a logarithmic relationship.

Unified Deposition Data Base Committee, 1985. **A Unified Wet Deposition Data Base for Eastern North America: Data Screening, Calculation Procedures, and Results for Sulphates and Nitrates (1980).** Prepared for the Canadian Federal/Provincial Research and Monitoring Co-ordinating Committee by the Unified Deposition Data Base Committee (Co-ordinated by M. Lusis).

Abstract: This report contains proposed precipitation data screening and wet deposition calculation procedures as well as the resulting data set for sulphates and nitrates in Eastern North America for 1980.

Whelpdale, D.M. and L.A. Barrie, 1982. **Atmospheric Monitoring Network Operations and Results in Canada.** Water, Air and Soil Pollution, 18, 7-23.

Abstract: Atmospheric monitoring activities in Canada relevant to the long-range transport of atmospheric pollutants and the 'acid rain' problem are reviewed. Results from a number of these networks are presented for the purpose of outlining the nature and extent of air and precipitation contamination by pollution released in eastern North America.

Wiebe, H.A., R.J. Vet, L.A. Barrie and K. Anlauf, 1985. **Canadian Air and Precipitation Monitoring Network (APN) Final Data Report December 1982-1983.** Atmospheric Environment Service, Downsview, Ont. Report AQRB-85-008-T.

Abstract: The air and precipitation monitoring network (APN), in operation since November 1978, has been used to obtain information on the quality of air and precipitation on a daily basis at regionally representative locations in Canada. Covering the period December 1982 to mid-1983, this report presents the final results from eight APN sites before they became part of the new Canadian Air and Precipitation Monitoring Network (CAPMoN) in mid-1983. The Atlantic Region APN sites were at Kejimkujik, N.S. and Bay d'Espoir, Nfld.

Wiltshire, J.F., 1979. **The Long Range Transport of Atmospheric Acids; A Sulphur Budget for Nova Scotia.** Environment Canada, Report EPS 5-AR-79-8.

Abstract: A sulphur budget is constructed in which annual deposition of sulphur species is estimated. Sources of SO_4 deposition are estimated to be 24% internal, 9% natural and 67% external.

Wiltshire, J.F., 1982. **Atmospheric Sulfur Budgets for the Provinces of Atlantic Canada.** Draft Report. Environmental Protection Service, Atlantic Region, Dartmouth, N.S.

Abstract: Employing a statistical model for the atmospheric transport and deposition of sulfur in the Region, atmospheric sulfur budgets were developed for the period 1977-1980. It is estimated that 80% of the deposition in the Region is due to SO_2 emissions imported into the Region.

Zitko, V. and W.V. Carson, No Date. **Heavy Metals, pH, and Sulfate in the Precipitation in Southern New Brunswick, Canada.** Department of Environment, Biological Station, St. Andrews, N.B.

Abstract: Concentrations of zinc, copper, lead, iron, mercury, and cadmium in precipitation collected between October 1970 and February 1971 in the vicinity of St. Andrews, N.B., are reported. The amount of mercury deposited from precipitation may be responsible for the elevated levels of mercury in fish from lakes in southeast New Brunswick. Sulfate and pH were determined in a later survey taken between May 1975 and March 1976.

CONTROLS

Clarke, A.J., 1980. **The use of Nova Scotia coal for power generation - the options for environmental protection.** British Electr. Int. Ltd., 30 Millbank, London, SW1P 4RD GBR. *

Abstract: This report examines the environmental consequences of increasing the future use of indigenous coal for electricity generation in Nova Scotia. Part One of the report deals with the environmental effects of sulphur dioxide emissions and discusses the options available to control emissions. Part Two of the report examines the environmental impact of emissions other than sulphur dioxide.

Environmental Protection Service, 1984. **Acid Rain and Atlantic Canada.** Submission to the Parliamentary Subcommittee on Acid Rain, St. John's, Newfoundland.

Abstract: The role of the Atlantic regional offices of the Environmental Protection Service in the area of control strategies is described, as well as an introduction to the regional perspective on the acid rain issue.

Kozak, J.H. and G.J. Ternan, 1982. **Discussion Paper on Possible Control Strategies for SO_2 Emissions Reductions in Nova Scotia and New Brunswick.** Environmental Protection Service, Atlantic Region, Dartmouth, N.S.

Abstract: A preliminary SO_2 control strategy for Nova Scotia and New Brunswick is developed, based on the available information on impacts, predicted emissions and control costs.

Ternan, G.J., 1982. **Sulphur Dioxide Emissions and Controls in Nova Scotia - 1980, 1990 and 1995.** Environmental Protection Service, Atlantic Region, Dartmouth, N.S.

Abstract: SO_2 emissions in Nova Scotia are predicted for the years 1990 and 1995 and compared with reported emissions for the year 1980. A number of options available to reduce SO_2 emissions, with associated costs, are discussed.

Ternan, G.J., 1983. **Sulphur Dioxide Emissions and Controls in New Brunswick - 1980, 1990 and 1995.** Environmental Protection Service, Atlantic Region, Dartmouth, N.S.

Abstract: SO_2 emissions in New Brunswick are predicted for the years 1990 and 1995 and compared with reported emissions for the year 1980. A number of options available to reduce SO_2 emissions, with associated costs, are discussed.

HEALTH

Chau, Y.K., P.T.S. Wong and F.C. Elder, 1983. **Leaching of Metals from Domestic Pipe Systems by Acid Waters.** National Water Research Institute, Environment Canada, Burlington, Ont.

Abstract: Laboratory studies on the effect of pH on the leaching of metals from domestic plumbing materials indicate that significant changes occur in new pipe material during the first few weeks of contact with water. Decreasing pH results in increased rates of leaching of metals.

Meranger, J.C. and D.R. Gladwell, 1985. **The application of a conceptual model to assessing the impact of acid rain on drinking water quality: I: Description of the model, study rationale and preliminary data analysis.** Proceedings of the International Conference on Acid Precipitation and Human Health, Uppsala, Sweden, Aug. 14-15.

Abstract: A theoretical conceptual model has been developed and applied to the interpretation of water chemistry data obtained from three communities in central and eastern Canada. Shelburne, N.S. is the Atlantic Region community which was studied.

Cowell, D.W. and A.E. Lucas, 1983. **Terrain characteristics of eastern Canada: Acid precipitation and implications for forest productivity.** Proceeding and map at Acid Rain and Forest Resources Conference. 14-17 June 1983. Quebec City, Que. *

Abstract: Not available at time of printing.

Cowell, D.W., A.E. Lucas, H. Hirvonen, G. Gilbert, G.M. Wickware and C.D.A. Rubec, 1983. The potential of soils and bedrock to reduce the acidity of incoming acid deposition for eastern Canada, Appendix I (Figure 3.9) and Section 3.5 Aquatic ecosystems sensitive to acid deposition, pp. 3.30-3.46; Section 4.5 Sensitivity assessment (Terrestrial Impacts), pp. 4.64-4.82. IN: **USA-Canada Memorandum of Intent on Transboundary Air Pollution.** Final Report Phase III, Impact Assessment Working Group I, MOI Secretariat, Environment Canada, Burlington, Ont.

Abstract: The topics discussed in Section 3.5 include the watershed sensitivity of eastern North America to acidic deposition, aquatic-terrestrial relationships, and geochemical changes in soils due to acidic precipitation. Terrestrial sensitivity mapping and interpretations for eastern North America are presented in Section 4.5.

Cox, R.M., 1983. **Sensitivity of forest plant reproduction to long range transported air pollutants: *In vitro* sensitivity of pollen to simulated acid rain.** The New Phytologist, 95: 269-276.

Abstract: Relative sensitivities of pollen germination and pollen tube growth from 13 forest species to a range of acidities found in ambient rainfall are reported in this paper.

Cox, R.M., 1984. **Sensitivity of forest plant reproduction to long range transported air pollutants: *In vitro* and *in vivo* sensitivity of *Oenothera Parviflora* L. pollen to simulated acid rain.** The New Phytologist, 97: 63-70.

Abstract: Effects of simulated acid precipitation on pollination in *Oenothera Parviflora* L. from different populations were examined both *in vitro* and *in vivo*. The responses of pollen to acidity (pH 5.6 to 2.6) in standing drop cultures and the stigma receptivity of flowers under field simulations of acid rain were observed.

Cox, R.M., 1985. **The response of plant reproductive processes to air pollution.** Proceedings of Nato Advanced Research Workshop - Effects of Acidic Deposition and Air Pollutants on Forest, Wetlands and Agricultural Ecosystems, Toronto, May 13-17.

Abstract: Long range transported air pollutant effects on reproductive processes of plants are reviewed and its relevance discussed.

Cox, R.M., (In press). ***In vitro* and *in vivo* effects of acidity and trace elements on pollen function.** In: Biotechnology and Ecology of Pollen. Springer-Verlag.

Abstract: Trace element effects on pollen in combination with acidity are described in this paper.

Hawkins, G.R. and A.J. Spavold Tims, 1984. **The Sensitivity of New Brunswick Ecosystems to Acidification.** Tech. Rep. No. T-8401. Environment New Brunswick, Fredericton N.B.

Abstract: A large portion of New Brunswick's land mass was found to be sensitive to acidification due to the predominant non-calcareous surficial and bedrock geology. An evaluation of Environment New Brunswick surface water chemistry data collected from 1973 to 1980 on 64 lakes and 77 rivers shows that waters in southwestern and north central New Brunswick are the most susceptible to acid rain. Based on alkalinity, 40 lakes and 34 rivers were found to be sensitive to acidification.

Hirvonen, H.E., 1984. **Terrain sensitivity to acidic precipitation in Nova Scotia.** Lands and Integrated Programs Directorate, Environment Canada, Dartmouth, N.S.

Abstract: This report and 1:500 000 coloured map present the sensitivity of the terrain of Nova Scotia to acid deposition based on the relative buffering capacity of the landscape to neutralize acidic precipitation. 85 percent of the province is considered to have moderately high to high sensitivity to acid precipitation.

Kerekes, J. (ed.), 1982. **Workshop Proceedings, Kejimkujik Calibrated Catchments Program on the Aquatic and Terrestrial Effects of the Long-Range Transport of Air Pollutants, November 18, 1981.** Atlantic Region LRTAP Monitoring and Effects Working Group.

Abstract: The Proceedings provides an overview of the work being done in the Kejimkujik Catchments of Nova Scotia. See GENERAL section for list of contents.

Kerekes, J. (ed.), 1983. **Workshop Proceedings, Kejimkujik Calibrated Catchments Program on the Aquatic and Terrestrial Effects of the Long-Range Transport of Air Pollutants.** Atlantic Region LRTAP Monitoring and Effects Working Group, April 26, 1983.

Abstract: The Proceedings provides an overview of the work being done in the Kejimkujik Catchments of Nova Scotia. See GENERAL section for list of contents.

Kerekes, J. and J. Dale, 1985. **Bibliography, Kejimkujik Calibrated Catchments Program (Nova Scotia) on The Aquatic and Terrestrial Effects of the Long-Range Transport of Air Pollutants.** Environment Canada, Canadian Wildlife Service, c/o Biology Department, Dalhousie University, Halifax, N.S.

Abstract: This bibliography lists reports and publications dealing with the effects of the long range transport of air pollutants on the Kejimkujik, N.S. calibrated catchments.

Lucas, A.E. and D.W. Cowell, 1984. **Regional assessment of sensitivity to acidic deposition for eastern Canada.** Chapter 6 in: Geological Aspects of Acid Deposition. Ed. by J.I. Teasley, Butterworth Publishers, Stoneham, Mass., pp. 113-129.

Abstract: This chapter presents a regional sensitivity assessment of surface waters in eastern Canada. The interpreted sensitivity is based on the potential for soils and bedrock, in combination, to reduce the acidity of acidic deposition before its entry into the aquatic regime.

Machell, J.R., O. Vaidya and D.B. Walter, 1982. **The Effects of Halifax Emissions on Metal Concentrations in Epiphytic Lichen *Usnea*.** Environment Canada, Report EPS-AR-83-4.

Abstract: The levels of ten metals in the epiphyte *Usnea* from fourteen sites 4-75 Km east and west of Halifax are reported. Elevated concentrations of V and Ni which show a significant relationship with distance from the urban area were recorded. The increase in these metals was related to local urban air emissions from the combustion of heavy fuel oils.

Mahendrappa, M.K., 1982. **Effects of SO_2 pollution on nitrogen transformation in some organic soils of northeastern New Brunswick: ammonia volatilization.** Canadian Journal of Forest Research, 12 (2): 458-462.

Abstract: Ammonia volatilization from organic (raw humus) horizons collected from an area in northern New Brunswick variously affected by SO_2 (point source) pollution was studied under laboratory conditions.

Mahendrappa, M.K., 1983. **Chemical characteristics of precipitation and hydrogen input in throughfall and stemflow under some eastern Canadian forest stands.** Canadian Journal of Forest Research, 13 (5): 948-955.

Abstract: At the Acadia Forest Experiment Station in central New Brunswick chemical characteristics of rain samples collected at five different locations were determined during the 1977-1981 period.

Mahendrappa, M.K., 1985. **Sulfur and various metal constituents of throughfall and stemflow of some eastern Canadian forest stands, and in incident precipitation.** Maritimes Forest Research Centre, Fredericton, N.B. Submitted to Biogeochemistry.

Abstract: Concentrations and quantities of S, Al, B, Cu, Fe, Mn, Ni, Pb, and Zn were determined in throughfall and stemflow samples, collected from 1971-1981, in six softwood and three hardwood stands located in central New Brunswick. Incident bulk precipitation samples collected during the same period in open areas near each of the stands were also analyzed for the above elements.

Mahendrappa, M.K., (In press). **Abilities of organic horizons under some eastern Canadian forest stands to alter the acidity of rainwater.** Canadian Journal of Forest Research.

Abstract: Various data, collected over a 10-year period, from different softwood and hardwood stands located at the Acadia Forest Experiment Station in central New Brunswick, are evaluated to demonstrate differences between stands in their ability to alter the acidity of rainwater. In the soil organic horizons, retention and exchange processes are shown to be effective in altering the acidity of rainwater.

Mahendrappa, M.K. and D.G.O. Kingston, 1982. **Prediction of throughfall quantities under different forest stands.** Canadian Journal of Forest Research, 12 (3): 474-481.

Abstract: The quantitative distribution of throughfall in fertilizer-treated and control plots under six softwood and three hardwood stands and rainfall in open areas close to these stands were intensively measured during 1977-1978.

Percy, K.E., 1979. **The histochemical effects of a long duration, low-concentration exposure to sulfur dioxide on elongating, current year needles of *Pinus strobus* L. and *Pinus banksiana Lamb*.** M.Sc. Thesis, University of New Brunswick, Fredericton, N.B. *

Abstract: SO_2 at a concentration of 5 pphm delayed maturation of white pine needles but had no effect on the development of jack pine needles.

Percy, K.E. and J.J. Kerekes (eds.), 1981. **Kejimkujik calibrated catchments program on the aquatic and terrestrial effects of the long-range transport of air pollutants for 1980-81.** Environment Canada, Atlantic Region.

Abstract: The Kejimkujik Calibrated Lake Catchments Program is one of five lake catchment studies established to study the effects of acid rain in sensitive receptor ecosystems in Canada. The purpose of this report is to compile and outline the various studies on-going in the Kejimkujik lake catchments in Nova Scotia in 1980/81.

Percy, K.E. and J.J. Kerekes (eds.), 1982. **Kejimkujik watershed study on the aquatic and terrestrial effects of the long-range transport of air pollutants for 1982-83.** Environment Canada, Atlantic Region.

Abstract: This report is a collection of study outlines comprising the 1982/83 activities of the various agencies involved in the Kejimkujik Watershed Study.

Percy, K.E. and R.T. Riding, 1978. **The epicuticular waxes of *Pinus strobus* subjected to air pollutants.** Canadian Journal of Forest Research, 8 (4): 474-477.

Abstract: Pollutants bring about an early weathering of surface waxes in white pine needles.

Percy, K.E. and R.T. Riding, 1981. **Histology and histochemistry of elongating needles of *Pinus strobus* subjected to a long-duration, low-concentration exposure of sulfur dioxide.** Canadian Journal of Botany, 59 (12): 2558-2567.

Abstract: Two-year-old seedlings of *Pinus strobus* were grown from budbreak to bud set in air containing sulfur dioxide. Histological and histochemical effects on elongating needles were examined.

Riding, R.T. and K.A. Boyer, 1983. **Germination and Growth of Pine Seedlings Exposed to 10-20 pphm Sulphur Dioxide.** Environmental Pollution (Series A), 30, 245-253.

Abstract: SO_2 effects on pine seedlings are more acute in fall than spring and summer plantings.

Riding, R.T. and K.E. Percy, 1985. **Effects of SO_2 and other air pollutants on the morphology of epicuticular waxes on needles of *Pinus strobus* and *Pinus banksiana*.** The New Phytologist, 99: 555-563.

Abstract: SO_2 and other air pollutants delay wax formation on white pine needles and bring about early weathering of waxes. Effects are most obvious in the year of needle elongation. There were no visible alterations of stomatal waxes in jack pine.

Rubec, C.D.A., 1981. **Characteristics of terrestrial ecosystems impinged by acid precipitation across Canada.** Working Paper No. 19. Lands Directorate, Environment Canada, Ottawa, Ont.

Abstract: This report examines the types of soils, vegetation and surficial geology of land across Canada receiving precipitation with a mean annual acidity of less than pH 5.6. Over 79% of areas impinged by acidified precipitation have poorly buffered, acidified soils or almost bare rock.

Shilts, W.W., 1981. **Sensitivity of Bedrock to Acid Precipitation: Modification by Glacial Processes.** Paper 81-14. Geological Survey of Canada, Ottawa, Ont.

Abstract: Three 1:1,000,000 scale coloured maps show the sensitivity of bedrock and derived soils to acid precipitation for south-central and southeastern Canada. The paper discusses the modification of this sensitivity evaluation by glacial processes.

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Abstract: The effects of simulated rain of pH 2.6 to 5.6 on pollen germination and pollen tube growth were studied in white spruce under three temperature regimes. Results indicate that little or no adverse effects were produced on germination and pollen tube growth by acid rain of pH above 3.6 during release or germination.

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Abstract: A survey for sulfur dioxide damage in the vicinity of a linerboard mill revealed that most damage was restricted within 0.8 km of the source. The incidence and intensity of the damage varied between species and between sites. The 'Species Damage Index' (SDI) and 'Composite Site Damage Index' (CSDI) are proposed to quantify the impact of the pollutant.

Sidhu, S.S. and J.G. Zakrevsky, 1982. **A standardized method for determining buffering capacity of plant foliage.** Plant and Soil, 66: 173-179.

Abstract: A method for determining the buffering capacity of foliage extracts was standardized and evaluated.

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